Zambia - Water Sector Performance Improvement Project (WSPIP)

Environmental and Social Management Framework (ESMF)
Rehabilitation of Water Supply and Sanitation Services in 3 District Towns (Chongwe, Luangwa and Kafue)

FINAL REPORT

Lusaka Water and Sewerage Company (LWSC)

September 12, 2008
Table of Contents

EXECUTIVE SUMMARY ................................................................................................................. 4

ACRONYMS AND ABBREVIATIONS ......................................................................................... 9

1 INTRODUCTION .......................................................................................................................... 11

1.1 Background and Justification for the Project ........................................................................ 11

1.2 Components Requiring and Environmental and Social Screening ................................... 12

1.3 Outline of Structure of the Report ....................................................................................... 13

1.4 Terms of Reference (TOR) for the Study ............................................................................ 14

2 PROJECT WORKS .................................................................................................................... 17

2.1 Rehabilitation and Upgrading ............................................................................................. 17

2.2 Chilanga .............................................................................................................................. 19

2.3 Kafue ................................................................................................................................ 19

2.4 Chongwe ............................................................................................................................. 21

2.5 Luangwa ............................................................................................................................... 22

2.6 Additional Recommendations ............................................................................................ 23

3 UPDATE OF POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK ......................... 24

3.1 World Bank’s Safeguard Policies ........................................................................................ 24

3.2 OP/BP 4.12 Involuntary Resettlement .............................................................................. 25

3.3 Applicability of OP/BP 7.50 Projects on International Waterways ................................... 25

3.4 Environmental Council of Zambia ...................................................................................... 26

4 ENVIRONMENTAL AND SOCIAL BASELINE ..................................................................... 28

4.1 Overall biophysical context ............................................................................................... 28

4.2 Rainfall and Hydrology ....................................................................................................... 31

4.3 Groundwater Resources ..................................................................................................... 31

4.4 Catchment Hydro-Environment ............................................................................................ 32

4.5 Overall Socio-Economic Context ....................................................................................... 33

5 THE ENVIRONMENTAL and social management PROCESS ............................................. 36

5.1 Consultant’s Approach to the ESMF Process .................................................................... 36

5.2 Environmental and Social Management Plan ................................................................... 37

5.3 Monitoring Schedule and Guidelines for Contractors ....................................................... 37

5.4 Public Consultation ............................................................................................................ 37

5.5 Summary Findings from the Social Awareness and Public Health & Safety Meetings .... 37

5.6 Community Concerns ......................................................................................................... 37

5.7 Concluding Remarks .......................................................................................................... 37

5.8 GIS Data and Mapping ........................................................................................................ 37

6 POTENTIAL IMPACTS AND CONVENTIONAL MITIGATION MEASURES ................... 37

6.1 Methodology ....................................................................................................................... 37

6.2 Overall ................................................................................................................................ 37

6.3 Impacts Anticipated During the Works ............................................................................. 37

6.4 Impacts on Hydrology ......................................................................................................... 37

7 The Environmental and Social Screening Process ............................................................... 37

List of Tables

Table 1. Components of the WSPIP Additional Financing (AF) .................................................. 17
Table 2. Chilanga Water Supply Works and Infrastructure – Works Items ................................. 19
Table 3. Kafue Water Supplies and Water Treatment Works – Works Items ......................... 19
Table 4. Kafue Sewerage Treatment Works and Infrastructure – Works Items ....................... 20
Table 5. Chongwe Water Treatment Works and Infrastructure – Works Items ....................... 21
Table 6. Luangwa Water Treatment Works and Infrastructure – Works Items ....................... 22

Final Report
September 2008
Norconsult 2
Table 7. Kafue Coliform Contents ........................................................................................................32
Table 8. Summary of Major Issues Raised at Community Meetings ....................................................37
Table 9. Key Institutional Stakeholders .................................................................................................37
Table 10. Summary of conventions used for impact assessment ..........................................................37
Table 11. ENVIRONMENTAL AND SOCIAL CHECKLIST: Works Items that are likely to require a
very limited ESMP (Localised short-term low intensity) ..................................................................37
Table 12. Highly Localised Works Items that are likely to require some ESMP (localised short to
medium duration and intensity) .........................................................................................................37
Table 13. ENVIRONMENTAL AND SOCIAL CHECKLIST: Localised Works Items that are likely
to require an ESMP (Local to regional medium duration and intensity) ........................................37
Table 14. ENVIRONMENTAL AND SOCIAL CHECKLIST: Site Specific Works Items that are
likely to require a separate EIA and a Comprehensive ESMP (local to regional medium to long-term,
high intensity) ..................................................................................................................................37
Table 15. ENVIRONMENTAL AND SOCIAL MANAGEMENT (ESMP) Summary .........................37

List of Figures
Figure 1. Hydrological Analysis of Rehabilitation Works on Kafue River (from Source) ................... 37

List of Boxes
Box 1 .................................................................................................................................................. 26
Box 2 .................................................................................................................................................. 37

Appendices
A: People Consulted & References, ESMF TEAM
B: GIS Mapping and Site Photos
C: Socio-Economic Findings Report
D: Public Health & Safety Findings Report
E. Compensation Policy/ Resettlement Framework
F: Review of Hydrogeological Data

Final Report
September 2008

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EXECUTIVE SUMMARY

Project Outline – Water Sector Performance Improvement Project
The project is funded by the World Bank and its main focus is to support improved performance and increase water and sanitation services in the City of Lusaka, Zambia. The project is designed as an Adaptable Program Lending (APL) instrument in two phases.

Phase I (2006-2009) supports Lusaka Water and Sewerage Company (LWSC) with an estimated US$ 20 m: This component aims to introduce performance improvements and commercial management methods for LWSC to become a financially sustainable utility with the ability to finance new investments from its own cash flows in the longer term. The majority of the works and goods under this component are aimed at rehabilitation. This includes funds for Emergency Works, goods, works and working capital to support a Development Financing Agreement, a Human Resources Strategy and Implementation, Design and Tenders and EIA for Phase I.

The achievement of the key objectives in Phase I would permit the move to Phase II which would include the scale up of infrastructure investments in urban areas, mainly Lusaka.

The current Environmental and Social Management Framework (ESMF) builds on the earlier ESMF (2006) that was prepared for the rehabilitation of the water and sewerage infrastructure in Lusaka by extending and expanding the provisions of the original ESMF to the new areas to be supported by the Additional Financing (AF), taking into account Zambia’s environmental policies and procedures as well as the Bank’s safeguard policies. These areas are the district towns of Kafue, Chongwe and Luangwa.

The rationale for adopting the ESMF approach is that the actual locations and potential adverse localized environmental and social impacts of the future sub-projects could not be determined prior to the appraisal of WSPIP. Once the actual sites have been identified during project implementation, qualified personnel, under the overall supervision of the implementing agency, LWSC, will (i) screen the sites for potential adverse environmental and social impacts; (ii) determine the appropriate environmental category of the planned sub-project; (iii) identify the Bank’s safeguard policies that might be triggered by the sub-project; (iv) implement and monitor the mitigation measures as recommended in the screening form; (v) arrange for the preparation of a separate EIA report, if indicated by the screening results; and (vi) arrange for the review and clearance of the screening results and the separate EIA reports as outlined in the environmental and social screening process (chapter 7).

Study Framework
This ESMF covers the items as defined below:

i. Engineering works for rehabilitation, networks extensions and other works in the medium phase for the implementation of the Performance Agreement
ii. Working capital for operational costs in the Performance Agreement
iii. Implementation of the ESMF and relevant capacity building for environmental and social management

Project Works
It is important to understand the scope of the works, in order to also understand the Consultant’s approach in dealing with both the evaluation of the environmental impacts, and the subsequent reporting.

Within the 3 district towns these comprise the following main elements:

- **Kafue**
  - Repairs to water treatment plant, the river intake and pumps
Repairs to pipe work at reservoir and the transmission mains to consumers
Extensions of water supply networks to provide for more consumers
Repairs to sewer pump stations and sewer lines, extensions to the system
Provision of water meters and valves for management and measurement
5 Peri-urban sanitation demonstration - pilots

- **Chilanga**
  - Replacement and repairs to borehole pump equipment
  - Chlorination dosing equipment
  - Repairs to rising mains and distribution network
  - Extension of network to additional 260 houses
  - Provision of new 100m³ reservoir

- **Chongwe**
  - De-silting of the Chongwe dam to increase on the water storage capacity
  - Upgrade and securing of the existing building for the pump station
  - Replacement of intake pumps to supply the treatment works
  - Upgrading the water treatment system from manual to automated

- **Luangwa**
  - Replace intake main, provide standby pump and upgrade high lift pumps
  - Refurbish treatment plant and provide chemical dosing equipment
  - Repair two reservoir tanks and fit with valves and meters
  - Rehabilitate the water network, and reinforce at road crossings
  - Extend the water network and provide water meters
  - Decommission salty wells and link consumers to pipe work
  - Sanitation demonstrations - pilots

**Main issues**

All towns are experiencing serious challenges with providing safe water supply and sanitation due to the dilapidated state of the infrastructure with leaking supply mains, limited lack of proper treatment, intermittent power and consequent water supply. In addition issues specific to each of the towns are summarized below.

- **Kafue**:
  - Non-functioning sewage pumps with clogged sewer lines resulting in overflowing of sewage water with high health hazard
  - Overgrown maturation ponds with effluent being discharged near water supply intakes
  - Increasing trend in number of reported cases of waterborne diseases, high public health impact
  - People that have settled near the maturation ponds in the ZESCO wayleave will need compensation to give way for the desludging works

- **Chilanga**:
  - Limited water supply as few boreholes are operating (e.g. only 1 in Chilanga estates and 1 in Chilanga Game and Fisheries area)
  - Need to extend water supply to new communities and provide sanitation demonstrations
  - Rehabilitation of the boreholes and storage tank including fencing in Chilanga estates will displace a youth group that is currently using water for making cement blocks, relocation scheme is needed to maintain the business
  - The supply main passes under the foundation of a house that most likely has been built illegally. Either the pipe can be rerouted or the illegal structure

Final Report
September 2008
Norconsult
demolished. In case of the latter and depending on the circumstances in which the structure was built, it will be necessary to agree on compensation.

- **Chongwe**
  - The water treatment works draws water from the Chongwe river, which is heavily impacted from discharge of sewage from the Kaunda Square treatment ponds in Lusaka, should consider treatment at source prior to rehabilitation at supply point
  - Except for makeshift chlorination there is no water treatment, the presence of particles can be seen up to supply point
  - Resources for adequately boiling the water are very limited with consequent very high risk of contracting disease from partially treated water.
  - The silt to be removed from the Chongwe dam will need to be chemically tested to examine its suitability for use as fertilizer, alternatively land will need to acquired for composting

- **Luangwa**
  - The treatment works are currently not functioning resulting in people in half of the town consuming untreated water from the Zambezi.
  - The remaining part of town are consuming saline borehole water or are forced to walk long distances to collect water
  - Decommissioning of the borehole and rehabilitation of the treatment works and extension of piped water will provide the communities with safe water

**Policy, Legal and Administrative Framework**

**The World Bank’s Safeguard Policies**

The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally and socially sustainable, and thus to improve decision making. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans boundary and global environmental aspects. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA.

The link between OP 4.01 and this ESMF is anchored in the concept of undertaking environmental screening of each proposed sub-project to determine the appropriate extent and type of environmental assessment. The screening requirement forms the basis of the environmental and social screening process outlined in the ESMF, and ensures that the appropriate environmental category (A, B, C, FI) is determined, and the appropriate level of environmental work is carried out based on the assigned environmental category.

Conceptually, the ESMF uses the same approach for assigning the appropriate environmental category as OP 4.01, but adapts it to the sub-project level so as to ensure speedy implementation of future sub-projects. The adaptation is included at the end of the Environmental and Social Screening Form (chapter 7 – annex 1) where the environmental category B is subdivided into B1 (application of simple mitigation measures); and B2 (separate EA will need to be prepared for the sub-project).

The link between OP 4.01 and the requirements of national environmental legislations is established through the environmental and social screening process outlined in the ESMF which bridges the gap between the requirements of national environmental legislation and OP 4.01. National environmental legislation generally does not require the environmental screening of small-scale sub-projects and therefore potential adverse localized environmental and social impacts cannot be identified early on. However, OP 4.01 requires the screening of all sub-projects to determine the requisite level of
environmental work. Such an environmental and social screening process for small-scale investments is currently not available under Zambia’s environmental procedures, and therefore, the requirements of OP 4.01 will be applied to all sub-projects as described in the relevant sections of this ESMF.

Based on the planned activities under WSPIP, OP 4.01 Environmental Assessment; OP 4.12 Involuntary Resettlement; and OP 7.50 Projects on International Waterways have been triggered. To comply with these policies, WSPIP has prepared this Environmental and Social Management Framework (ESMF) and a separate Resettlement Policy Framework (RPF) to ensure that future sub-projects are implemented in an environmentally and socially sustainable manner. Both documents will be reviewed, approved and disclosed by the Government of Zambia and the Bank at its Infoshop prior to appraisal of this proposed project. As regards OP 7.50, the exception provision will apply to the project and appropriate steps in compliance with this policy will be taken.

The consultant also examined the need for possible compensation as a result of the works associated with the proposed project in light of World Bank OP/BP 4.12. OP4.12 may be triggered in the project by:

- Encroachments - The social-economic analysis undertaken in the process of preparing the ESMF reported numerous cases where it is expected that pipes and other water and sewerage infrastructure belonging to LWSC has been built over. Houses, buildings and other assets (including gardens) have encroached on rights of ways. To access this infrastructure, LWSC may be required to destroy or damage assets (for instance, walls and fences) to undertake rehabilitation works.

- Unforeseen events, accidents, and by minor changes in project specifications that may cause damage to or loss of assets. In some areas, dwellings, fences, etc. are close to proposed infrastructure rehabilitation and access is very confined, for example during pipe laying.

Zambia’s Environmental policies and legislation

The Environmental Council of Zambia (ECZ) has two formats for environmental assessment:

- The first is an Environmental Project Brief (EPB), which covers small projects, and/or projects that undertake works in already disturbed areas.
- The second is a full Environmental Impact Assessment, which covers projects where impacts will occur to natural areas and/or to natural resources, as a result of new activities.

The regulations covering environmental assessment are covered principally by the Environment and Pollution Control Act (1990), and for purposes of ESMF, are covered by the 1997 Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations.

In terms of this project, the works are covered under the EPB Requirements of the ECZ as described under the First Schedule of the 1997 regulations.

Public Consultation

The public consultation and awareness programme has involved a 3 tier process:

i. Informal meetings held at community level in the proposed areas of works
ii. Ad hoc discussions with key Government agencies and NGOs as appropriate
iii. A formal workshop for key stakeholders held to present the draft report findings
Informal meetings with community leaders in affected areas have ensured that people who will be affected by the works programme are both aware of the impending project and are aware of the probable effects. Any comments or concerns raised by the community at this stage have been incorporated into the environmental management plan (EMP) where they are relevant.

In addition to the site inspections and consultations within the LWSC, extensive consultations were carried out with people from different departments within Government Ministries and Departments, and with representatives of communities that will be affected by the rehabilitation works programme.

Additional communications were held with the ECZ regarding the expected levels of impacts and proposals to cover the likely approach of the ESMF, mainly through an EMP.

**Environmental Impacts**

Overall, once the works are completed, there will be a significant net positive social and environmental benefit to the communities of Kafue, Chongwe and Luangwa.

However, limited negative environmental and social impacts will occur for short periods during the works. Through screening for environmental and social impacts, and by careful pre-planning by the organisation contracted to undertake the rehabilitation works, all the negative impacts can be addressed through either the implementation of appropriate mitigation measures, or, the preparation of a separate EIA report which would include an Environmental and Social Management Plan (ESMP). Compensation issues if any arising from damage or destruction to assets will be addressed through the RPF. The Environmental Officer, LWSC, will oversee the implementation of the ESMF & RPF.

The bulk of the impacts fall under Construction phase works, mainly trenching and excavation works. There are two categories of trenching works, firstly water supply lines, and secondly sewer pipelines.

The water supply lines are mainly small diameter, especially in the peri-urban settlements, where the longest sections of pipeline are to be installed. The trenches will mostly be up to 1.5 m depth and approximately 0.5m wide.

Most of the sewer trench works will occur in urban areas, and most of the trenches will be of depths to a maximum of 2m and widths to a maximum of 1.5m.

The secondary or indirect impacts of the trenching works will be disruptions to traffic, pedestrians, and safety issues where trenches are located along pedestrian pathways and where they may block access to private and/or public property in both residential and commercial areas in Lusaka.

These impacts can be minimised, in terms of severity and duration, by ensuring that the excavation and construction works are limited to short working sections, and that works are carried out rapidly and efficiently. Furthermore, Environmental Guidelines for Contractors (chapter 7 – annex 4) will be attached to the bidding documents to ensure that potential adverse environmental and social impacts due to construction and/or rehabilitation activities are appropriately mitigated.

The remainder of the impacts will be site specific, and generally within the LWSC operating sites in these three districts. The ESMP for the project has been drawn up according to the anticipated impacts from the rehabilitation works and subsequent operating phases, based on experience with similar types of operations. The ESMP will be implemented by qualified LWSC personnel and contractors as outlined in Table 15 – Environmental and Social Management Plan (ESMP) for WSPIP.

**Conclusions**

The representative works as identified are unlikely to call for any permanent land take or destruction of houses and not necessitate any movement or resettlement of people. If assets are damaged or people’s lives disrupted, the RPF has been prepared to compensate for these actions.
Based on experience with similar types of operations, the environmental acceptability of the project may be summarised thus:

- **Terrestrial Ecology.** Very minor negative impacts; all capable of being reduced to an acceptable level through environmental management planning.

- **Aquatic Ecology.** No significant negative impacts on the Kafue River or on water courses in the relevant districts (e.g. Chongwe and Zambezi rivers)

- **Water Quality.** No negative impacts.

- **Air and Noise Quality.** Minor negative impacts associated with dust, fumes and noise from construction works and rock blasting.

- **Landscape.** Very small-scale and largely temporary negative impacts associated with works areas.

- **Socio-Economic and Cultural Environment.** Minor short-duration socio-economic impacts associated with construction works. Mitigation possible through an effective environmental management plan and resettlement policy framework.

### ACRONYMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>CDC</td>
<td>Chongwe District Council</td>
</tr>
<tr>
<td>DISS</td>
<td>Department of Infrastructure Support Services</td>
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<tr>
<td>DWA</td>
<td>Department of Water Affairs</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<tr>
<td>ECZ</td>
<td>Environmental Council of Zambia</td>
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<td>EFR</td>
<td>Environmental Flow Requirement</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>EPB</td>
<td>Environmental Planning Brief</td>
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<td>ESMF</td>
<td>Environmental and Social Management Framework</td>
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<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<tr>
<td>GIS</td>
<td>Geographical Information System</td>
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<tr>
<td>GRZ</td>
<td>Government of Republic of Zambia</td>
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<td>IDA</td>
<td>International Development Association</td>
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<tr>
<td>JICA</td>
<td>Japanese International Cooperation Agency</td>
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<td>KDC</td>
<td>Kafue District Council</td>
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<tr>
<td>LCC</td>
<td>Lusaka City Council</td>
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<tr>
<td>LDC</td>
<td>Luangwa District Council</td>
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<tr>
<td>LWSC</td>
<td>Lusaka Water and Sewerage Company Ltd</td>
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<td>LUs</td>
<td>Large Urban Areas</td>
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<tr>
<td>MEWD</td>
<td>Ministry of Energy and Water Development</td>
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<tr>
<td>ML/d</td>
<td>Million litres per day</td>
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<tr>
<td>MTENR</td>
<td>Ministry of Tourism, Environment and Natural Resources</td>
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<td>NWASCO</td>
<td>National Water and Sanitation Council</td>
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<tr>
<td>NECZ</td>
<td>National Environmental Council of Zambia (Website)</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<td>RPF</td>
<td>Resettlement Policy Framework</td>
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<tr>
<td>STW</td>
<td>Sewerage Treatment Works</td>
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<td>SUTs</td>
<td>Small Urban Towns</td>
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<tr>
<td>SWRP</td>
<td>Support to the Water Sector Reforms Project</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>USD</td>
<td>United States Dollar</td>
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<td>WRAP</td>
<td>Water Resources Assessment Programme</td>
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<tr>
<td>WSS</td>
<td>Water Supply and Sanitation</td>
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<td>WTW</td>
<td>Water Treatment Works</td>
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<td>ZESCO</td>
<td>Zambia Electricity Supply Corporation</td>
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<td>ZNFU</td>
<td>Zambian National Farmers Union</td>
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INTRODUCTION

1.1 Background and Justification for the Project

This project builds on and supports the ongoing reform in the Lusaka Water and Sewerage Company (LWSC) to improve water supply and sanitation service delivery through the Water Sector Performance Improvement Project (WSPIP). Initially the WSPIP was targeted at the City of Lusaka. It comprised both rehabilitation and emergency works of the existing infrastructure as well as institutional strengthening to enable LWSC to become a financially sustainable utility with the ability to finance new investments from its own cash flows in the longer term.

To enable sub-project implementers to assess the nature and extent and to minimise any adverse impacts resulting from future civil works e.g. such as sedimentation of water courses, noxious smell and spreading of diseases from excavations and stockpiling of fill, noise and dust, disruptions to traffic and livelihoods etc, the borrower prepared an Environmental and Social Management Framework (ESMF). The ESMF will be an integral part of project design and implementation and will be referred to in the loan agreements to ensure its effective implementation.

The rationale for adopting the ESMF approach is that the actual locations and potential adverse localized environmental and social impacts of the future investments could not be determined prior to the appraisal of the proposed operation. Once the actual sites have been identified during project implementation, qualified personnel, under the overall supervision of the implementing agency, LWSC, will: (i) screen the sites for potential adverse environmental and social impacts; (ii) determine the appropriate environmental category of the planned investment; (iii) identify the Bank’s safeguard policies that might have been triggered by the sub-project; (iv) implement and monitoring the appropriate mitigation measures, if appropriate; (v) arrange for the preparation of a separate EIA report, if indicated by the screening results; and (vi) arrange for the review and approval of the screening results and the separate EIA reports as outlined in the environmental and social screening process below.

In the course of preparing the ESMF, the consultant identified numerous cases where it was expected that pipes and sewerage lines belonging to LWSC had been built over. To ensure that any relocation/ resettlement are kept at a minimum and if found necessary, that affectees will be given fair compensation for any assets (e.g. houses, walls and fences) that may have to be destroyed, the borrower prepared a separate Resettlement Policy Framework (RPF). Both documents – the ESMF and RPF - will be reviewed, approved and disclosed in Zambia and by the Bank at its Infoshop prior to appraisal of WSPIP.

Following the ongoing improvements in Lusaka and the dire need to extend these to the surrounding districts, the Government of Zambia together with Lusaka City Council have resolved to increase the mandate of LWSC to form a regional utility for all of Lusaka province. In that regard the Government of Zambia has requested the World Bank for Additional Financing (AF) to upgrade water and sanitation services (WSS) delivery in the 3 districts of Chongwe, Kafue and Luangwa.

Specifically, the success of the improvements in the 3 districts and thus the overall aim to support GRZ’s commitment to improve access and sustainability of water sector services under WSPIP, will depend on LWSC’s continued ability to address both the physical and institutional works components including:

i. Inadequate and or complete lack of water and sewerage treatment facilities; dilapidated and inadequate distribution networks and storage facilities; poor individual and public connection to the water and sewerage network;
ii. Institutional weaknesses with poor commercial, financial, environmental, social, and Human resource capacities and systems and related operational challenges.

To enable LWSC to move forward with the planned rehabilitation and upgrading of water services in the 3 districts the goal of the current study is to update the ESMF that was prepared for the original project to include the new areas to be developed under the AF.

Keeping with the spirit of the ToR the report is termed ESMF – Environmental and Social Management Framework (ESMF).

1.2 Components Requiring and Environmental and Social Screening

The AF (USD 10 million IDA) will build on and support the ongoing rehabilitation and upgrading of water and sanitation services in Lusaka under Component A (Part I) of the WSSIP. Therefore, to achieve the intended development objective (i.e. of improving access and sustainability of the WSS in the 3 districts (Kafue, Chongwe and Luangwa) the AF includes 3 sub-components as follows:

i. Urgent works (USD 7.5 m): This component will support the need for immediate rehabilitation and augmentation of water and sewer/sanitation facilities (including on-site sanitation) in all the 3 districts. Production facilities will be rehabilitated to their original design capacity.

ii. Operational Cost Support (USD 1.0 m): This component will support LWSC to bridge the gap in operational costs for the 3 districts on a declining basis and will include costs of chemicals for water purification, license fees, running costs of vehicles, electricity and other utilities, and logistical support.

iii. Supporting restructuring of the regional Lusaka Water and Sewerage Company to incorporate the 3 districts (USD 1.5 m): This component will support LWSC to incorporate the 3 districts centres within the corporate structure of LWSC and will include: harmonization of the Human Resource Strategy; coordination of financial systems including billing and collections systems; telemetry and remote access systems; training and capacity building – including environmental training to ensure effective implementation of the ESMF; community outreach programs, including hygiene promotion; computers, vehicles and set-up of offices.

In summary AF will support the provision of an improved, more reliable and safer water supply to about 43,240 more consumers over the next three years. Production increases supported by the project should double the number of people currently provided for on piped systems.

However, of the above sub-components it is only the civil works components in (i) which are relevant to the ESMF and therefore forms the subject matter of this report. These works will include the following for the Lusaka Water and Sewerage Company (LWSC) in the districts of Chongwe, Kafue and Luangwa,

---

1 Component B will support capacity building within the MLGH to meet their increased water and sanitation (WATSAN) responsibilities, by supporting a number of key activities intended to facilitate the development of the sub-sector financing mechanism for rural water supply and sanitation, including harmonizing relevant MLGH procedures with other government programs.
- Water Supply: Rehabilitation of treatment works, transmission mains, and existing boreholes, and drilling of new boreholes

- Distribution: Mains renewal & rehabilitation, service reservoir storage, district metering and customer metering

- Mains Extensions: New development areas and peri-urban extensions:

- Sewerage: Rehabilitation of Sewage Pumping Stations and of existing Sewerage Network; extension of Sanitation to Peri-urban areas

- Sewage Treatment: Rehabilitation of existing treatment works and of existing maturation ponds

Sources: The assessments are based on information collected from the following field reconnaissance activities, discussions held in meetings with the Client LWSC, the Dept. of Water Affairs and comments and reactions received from the affected communities and during the consultative workshop. An overview of tasks and information obtained can be listed as follows:

Activities, June – July 2008:
13/6 Initial meeting with the Client LWSC and reconnaissance of the scope of works in Kafue, Chilanga and Chongwe.
16-20/6 Continuation of field survey to document the scope of works, collecting of background information and establishment of contact with the affected communities
24/6 Assessment of status and plan for further work
25/6 Chilanga, continuation of field survey
26 – 27/6 Luangwa, field survey and public consultations
4/7 Stakeholders consultative workshop to present findings
28/6 – 7/7 Continuation of field survey and public consultations
16/7 Draft ‘final report submitted
28/7 Final report submitted

1.3 Outline of Structure of the Report

This Table of Contents highlights the required contents of the ESIA Statement addressing applicable national and donor regulations. It contains the sections listed in the Terms of Reference, but with the order largely reflecting that used in the previous study as follows. Where assessments and recommendations differ, these are highlighted.

i. Executive Summary
ii. Introduction
iii. Description of Project Works
iv. Update of Environmental Policy, Legal and Administrative Framework (including discussion on the World Bank’s Safeguard Policies triggered by the Project as well as Zambia’s environmental policies and legislation)
v. Description of the Environment, both bio-physical and social (including baseline data as available)
vi. Methodology/ Description of the ESMF preparation process
vii. Significant Environmental and Social Impacts and Proposed Mitigation Measures (including sections on environmental and social benefits, cumulative and residual impacts)
viii. Description of the environmental and social screening process for future sub-projects
ix. Environmental Management and related Capacity Building and Training Plan

x. Appendices
  a) People Consulted & References, ESMF TEAM
  b) Socio-Economic Findings Report Health & Safety Findings Report
  c) GIS Mapping and Site Photos
  d) Review of Hydrogeological Data

1.4 Terms of Reference (TOR) for the Study

The TOR and inherent scope of works for the study as described in Requests for Proposals (RFP) and Minutes of Meeting (MoM) from the contract negotiations can broadly be summarized as follows:

Goal of the assignment

As mentioned in the above sections EA is needed to comply with applicable donor and statutory policies and can best be understood as a process where the overall aim is to properly incorporate environmental and social aspects into the project design and implementation in a sustainable manner.

Objectives of the assignment

To update the existing ESMF and RPF prepared for the original project to include the new areas to be developed under the AF the assessment should;

i. Provide descriptions of the proposed scope of works at each site. Detail the elements of the development, highlighting areas to be reserved for construction and the areas which are to be preserved in their existing state.

ii. Outline the Legislations and Regulations relevant to the project.

iii. Identify the major environmental issues of concern through the presentation of baseline data which should include social and cultural considerations. Assess public perception of the proposed development.

iv. Predict the consequences of the proposed infrastructure environmental, social, economic, and cultural perspectives and develop plans to mitigate any adverse impacts, resolve conflicts and enhance positive ones.

v. Predict the likely impacts of the development on the described environment, including direct, indirect, cumulative and residual impacts, and indicate their relative importance to the design of the development's facilities.

vi. Identify mitigation action to be taken to minimise adverse impacts and quantify associated costs.

vii. Design a Monitoring Plan which should ensure that the mitigation plan is adhered to (including the costing, scheduling and responsibility of such measures)

Outcomes of the EA

The expected output of the EA report will form a base for implementation of the Project.

Locations of the EA

The study areas for the assignment are the 3 districts of Chongwe, Luangwa and Kafue including the small town of Chilanga en-route to Kafue.

Duration and Timetable
Inception Report 30 June 2008
Draft EIA Report 17th July 2008
Final EIA Report 28th July 2008

Scope of Work
The EIA is owned by LWSC, and constitutes an integral part of the loan agreement and is a condition for project appraisal. To prepare the EIA report, the Consultant will:

- Form a specialized team of experts required to prepare the EIA. The team should be led by a project manager who is knowledgeable of EIA studies for projects of this type and of this magnitude and should include the appropriate specializations to assess the potential impacts and propose a relevant and implementable EMP. These would include, but may not necessarily be exclusive of the following.

Core team:
  - Team leader and general environmental assessment specialist
  - Sociologist
  - Environmental engineer with water and sanitation background

Probably additional team members used on short term basis:
  - Public health specialist
  - Hydrologist
  - Public participation specialist

- Compile baseline data and existing studies to present the potential environmental and social sensitivities in the area to be served. In addition to carrying out representative site visits, it is expected that the consultant will also rely to the extent possible on published data,

- Compile, edit and prepare the Draft and Final Environmental Impact Assessment (EIA) Reports, including an Environmental Management Plan.

- Identify the various public groups (e.g. people affected by the proposed water supply and sanitation improvements. The consultative program should focus on groups and individuals that will be directly affected. Public consultations should be held at least once in each of the districts.

Contents of the Environmental Impact Assessment (EIA)
The EIA shall be a concise document, which focuses on the most relevant issues, and will elaborate on the consultation activities with the various stakeholders, but with emphasis on the project affected communities. In order to assess each of the project sub-components for their potential environmental impact(s), the EIA should include the following:

i. An EIA for proposed rehabilitation and extension works, and

ii. An environmental management plan (EMP) that outlines the mitigation measures required for sub-components during the design, construction, and operation phases.

Scope of Services and Key Issues to be addressed
Water Supply and Sanitation: Conduct an environmental impact assessment (EIA) for the proposed supply sub-components. The EIA will include but not be limited to:

- Identification and analysis of relevant environmental and social issues;
• Detailed instructions on proper hazardous waste disposal (i.e. sewage contaminated water, sludge and sediments) including recommendations regarding HIV/AIDS awareness raising and training for construction crews and contractors;
• Identification and assessment of existing pollutant releases (i.e. wastewater and sewage) and natural attenuation potential;
• Identification and analysis of the most likely physical constraints;
• Definition of international standards for excavations, distance from habitation/existing infrastructure (clearances) and hazards preventatives
• Route selection and right-of-way;
• Existing environment and land use of the proposed project sites; including any endangered natural habitats to be crossed/encroached upon
• Economic and social benefits;
• Identification of any historical and cultural in the vicinity project sites;
• Specifications of materials to be used; and
• Any others site-specific environmental issues;

Overall:

• Analyze potential of alternatives to proposed sub-components if major, negative environmental impacts are identified.
• Identify necessary mitigation measures in all sub-components.
• Prepare an environmental management plan describing the management initiatives to be implemented during both the construction and operational phase of the project. The EMP should have three main components:
  o Institutional strengthening and training;
  o Environmental mitigation implementation program; and
  o Monitoring program.

Special emphasis will be given to the following:

• Institutional Component:
  o The EMP should describe institutional responsibilities for environmental management of water and sanitation sector, and the responsibilities for environmental monitoring, reporting and enforcement.

• Environmental Mitigation:
  o World Bank guidelines presents the key aspects of the mitigation plan. However, for each mitigation measure the EMP should clearly state the responsibilities for implementation and supervision, and cost.

• Environmental Monitoring Plan:
  o Monitoring should aim toward achieving the optimal operation performance as consistently as possible, while resulting in the minimum environmental and social impacts. The Monitoring Plan should clearly state the monitoring parameters, location, frequency, monitoring method, chemical analyses, responsibilities for implementation and supervision, and cost. Performance standards are typically based on national legislation and the guidelines contained in the World Bank's Pollution Prevention and Abatement Handbook.

• Conduct public consultations with the affected communities including presentation of the proposed improvements in a stakeholder's workshop. Public consultation events, feedback of the stakeholders, and the means the feedback was incorporated in the EIA should be clearly documented and presented in the EMAP report.
2 PROJECT WORKS

It is important to understand the scope of the works, in order to also understand the Consultant’s approach in dealing with both the evaluation of the Environmental Impacts, and the subsequent reporting.

As a water supply and sanitation project, there are a variety of components, and these are briefly described below. Reference is also made to the lists of maps in Appendix B showing outlines of the 4 project areas (within the 3 districts) and selected aerial images with existing and planned improvement to water services infrastructure superimposed. The descriptions are organized in order of the decreasing extent of the proposed works and inherent challenges in rehabilitating water and sanitation services in the 3 districts. Initial emphasis is therefore on Kafue, which has the highest population (>45000) and more complex WSS infrastructure than Chongwe and Luangwa, each with populations of about 1200 located about 45 and 330 km east of Lusaka.

2.1 Rehabilitation and Upgrading

The scope of works for this project covers a variety of elements, located at various points around the 3 towns/ project areas. The rehabilitation and upgrading works have different components and these fall under 6 main categories, as follows:

i. Replacement of non-working parts – mechanical, electrical and instrumentation (e.g. water flow meters, automated chlorination equipment)
ii. Replacement, or refurbishment of faulty or damaged equipment, especially pumps, pressure release valves and surge protection tanks, and broken water supply pipelines
iii. Repairs to leaking water storage tanks
iv. Replacement of decayed and broken sewerage supply pipelines and associated pumping equipment, and installation of new sewerage lines in urban and peri-urban areas
v. Repairs to non-working equipment, and to treatment pond infrastructure and embankments in the sewerage treatment works
vi. Removal and disposal of residual waste water and sludge from pipes and trenches
vii. Identification of new water supply boreholes in available open space around the towns and in the peri-urban areas

The summarised works items are provided in Table 1 below.

<table>
<thead>
<tr>
<th>Table 1. Components of the WSPIP Additional Financing (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

| Distribution |

Final Report
September 2008
Norconsult
For the purpose of this ESMF, the project elements have been assessed individually, however as representative works, according to location and the extent and duration of environmental impacts that are likely to occur. The exact environmental and social impacts will be determined during project implementation through the application of the environmental and social screening process to planned sub-projects at the actual sites.

Justification for this approach is provided later in this report, but it is important to be aware that the expected (negative) environmental impacts will only be experienced during the period when excavation works take place when the majority of the water and sewerage infrastructure repairs are underway. More detailed descriptions of the works items in each district town are provided in the following. To ensure that site specific issues such as possible relocation/loss of assets or harmful impacts to biodiversity are ascertained and properly dealt (e.g. preparation of RAP) the works items will undergo a screening prior to commencement. An environmental and social screening process (chapter 7) has been developed for this purpose.

2 It is assumed that one household connection gives access to 7 people, and one standpost gives access to 1,200 people, and one communal tap gives access to 300 people as per NWASCO service standards.
2.2 Chilanga

The Chilanga works areas include refurbishment of the main water treatment and pumping station, repairs to the rising main and the overhead storage tanks, as well as the development of a new borehole with associated pipe works. The works items are shown in Table 2 below; likely environmental and social mitigation measures are proposed based on experience with similar activities. The exact impacts will be determined through the application of the environmental and social screening process outlined in this ESMF.

Table 2. Chilanga Water Supply Works and Infrastructure - Works Items

<table>
<thead>
<tr>
<th>No.</th>
<th>Chilanga Estates</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Boreholes</td>
<td>Test, assume new</td>
<td>One new bore fully equipped</td>
</tr>
<tr>
<td>2</td>
<td>High lift main</td>
<td>Damaged rising main</td>
<td>Replace main to high reservoir</td>
</tr>
<tr>
<td>2</td>
<td>Network rehab</td>
<td>Water management</td>
<td>Check/repair leaks, create districts</td>
</tr>
<tr>
<td>2</td>
<td>Network extension</td>
<td>260 new houses</td>
<td>Include connection leads</td>
</tr>
<tr>
<td>5</td>
<td>Meters</td>
<td>Chlorine</td>
<td>Treatment dosing equipment</td>
</tr>
<tr>
<td>7</td>
<td>Reservoir</td>
<td>216 m3 Braithwaite</td>
<td>Test for leaks, repair, lining</td>
</tr>
<tr>
<td>10</td>
<td>Bores</td>
<td>Re-equip No2 bore</td>
<td>Provide new pump &amp; meter</td>
</tr>
<tr>
<td>10</td>
<td>Low reservoir</td>
<td>Roof &amp; meter</td>
<td>Repair roof, provide meter</td>
</tr>
<tr>
<td>10</td>
<td>High lift pumps</td>
<td>2 new pumps</td>
<td>Clear water tank to reservoir</td>
</tr>
<tr>
<td>10</td>
<td>WTP - Security</td>
<td>Fencing &amp; locks</td>
<td>Prevent theft &amp; vandalism</td>
</tr>
<tr>
<td>10</td>
<td>Reservoir meter</td>
<td>Outlet meter &amp; valve</td>
<td>Water measurement for management</td>
</tr>
<tr>
<td>10</td>
<td>SCADA</td>
<td>Remote supervision</td>
<td>SCADA, telemetry, video</td>
</tr>
</tbody>
</table>

Table codes:
2. Localised site EA to determine the need for an EIA. EMP is required
3. Highly localised site EA to determine the need for an EIA. EMP is required
5. Spot excavations and/or installations requiring an EMP
7. Spot repairs/installations above ground. Site-specific EMP
10. No EMP required

2.3 Kafue

This includes the areas within Kafue known as Nangongwa and Shikoswe. The works elements are broken into two parts, namely water supplies and sewerage treatment works. The project components for these are shown in Tables 3 and 4 below. Likely environmental and social mitigation measures are proposed based on experience with similar activities. The exact impacts will be determined through the application of the environmental and social screening process outlined in this ESMF.

Table 3. Kafue Water Supplies and Water Treatment Works - Works Items

Table codes:
2. Localised site EA to determine the need for an EIA. EMP is required
3. Highly localised site EA to determine the need for an EIA. EMP is required
5. Spot excavations and/or installations requiring an EMP
7. Spot repairs/installations above ground. Site-specific EMP
10. No EMP required
2. Localised site EA to determine the need for an EIA. EMP is required
5. Spot excavations and/or installations requiring an EMP
7. Spot repairs/installations above ground. Site-specific EMP
10. No EMP required

<table>
<thead>
<tr>
<th>Kafue</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Intake main</td>
<td>2.4 km steel 600mm</td>
</tr>
<tr>
<td>2</td>
<td>Transmission</td>
<td>Repairs to Mains</td>
</tr>
<tr>
<td>2</td>
<td>Networks</td>
<td>Repair and extend</td>
</tr>
<tr>
<td>2</td>
<td>Stand posts</td>
<td>in compounds</td>
</tr>
<tr>
<td>5</td>
<td>Meters</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Rising main</td>
<td>To reservoirs</td>
</tr>
<tr>
<td>5</td>
<td>Reservoirs</td>
<td>Pipe work</td>
</tr>
<tr>
<td>5</td>
<td>Meters &amp; valves</td>
<td>Town</td>
</tr>
<tr>
<td>5</td>
<td>Estates</td>
<td>450mm</td>
</tr>
<tr>
<td>5</td>
<td>House meters</td>
<td>200 mm</td>
</tr>
<tr>
<td>7</td>
<td>WTP - Chemicals</td>
<td>10,361 connections</td>
</tr>
<tr>
<td>10</td>
<td>Intake pumps</td>
<td>2 new pumps &amp; control</td>
</tr>
<tr>
<td>10</td>
<td>Control panel</td>
<td>Replace existing</td>
</tr>
<tr>
<td>10</td>
<td>Valves</td>
<td>Non-return</td>
</tr>
<tr>
<td>10</td>
<td>Meter</td>
<td>600mm magflo</td>
</tr>
<tr>
<td>10</td>
<td>Secure site</td>
<td>Provision</td>
</tr>
<tr>
<td>10</td>
<td>WTP - Valves</td>
<td>Process valves</td>
</tr>
<tr>
<td>10</td>
<td>WTP - Filters</td>
<td>Upgrade Filters</td>
</tr>
<tr>
<td>10</td>
<td>WTP - tanks</td>
<td>Inspect, repair</td>
</tr>
<tr>
<td>10</td>
<td>WTP - Security</td>
<td>Fencing &amp; locks</td>
</tr>
<tr>
<td>10</td>
<td>High lift pumps</td>
<td>Refurbish tanks</td>
</tr>
<tr>
<td>10</td>
<td>Meters</td>
<td>450mm and 200 mm</td>
</tr>
<tr>
<td>10</td>
<td>SCADA</td>
<td>Remote supervision</td>
</tr>
</tbody>
</table>

Table codes:

Table 4. Kafue Sewerage Treatment Works and Infrastructure – Works Items

<table>
<thead>
<tr>
<th>Kafue</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitation Works</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sanitation - STW</td>
<td>Dredge ponds</td>
</tr>
<tr>
<td>1</td>
<td>Sanitation Networks</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sanitation</td>
<td>5 demonstrations</td>
</tr>
<tr>
<td>3</td>
<td>Sewers</td>
<td>6 pump stations</td>
</tr>
</tbody>
</table>

Table codes:

1. Localised site EA, with on and off-site EMP requirements
2. Localised site EA to determine the need for an EIA. EMP is required
3. Highly localised site environmental assessment to determine the need for an EIA. EMP is required

Water Supply
The water supply system has two components, a pump intake on the Kafue River with water treatment works, piping and booster pump stations into the Kafue Water Treatment Works plant. From the WTW site, the water is pumped up to some large storage tanks on a nearby hill.
From the hill storage tanks, the water is reticulated through the town to existing off-take points. Many of these off-take points are in the industrial area and in the formally established settlement areas. The non-formal settlement areas such as Zambia Compound do not have household supplies, but instead, have local standpoints within communal areas.

**Sewerage Reticulation and Treatment**

The sewerage reticulation system starts at the off-take from individual properties, including private houses, business premises and from larger institutions (e.g. Government Offices, the main shopping area along the main road and the industrial areas etc). From there the primary sewers lead into larger and larger pipelines, located at increasing depths.

In some parts of the town, the sewage cannot continuously move down the various pipelines to the terminal treatment works areas. Where this occurs, the sewage is collected in a tank and pumped under pressure to the treatment works.

Sewer outfall lines follow specified gradients, and as a result, the largest diameter pipes are often buried at depths of about 3-4m below the ground. As a result any excavation work will require trenching to depths of 3-4m and widths of up to 1.5m.

The Sewerage Treatment Works consist of an Activated Sludge Treatment Plant, primary ponds where activated sludge is decomposed through bacterial action under anaerobic conditions, then the effluent flows into maturation ponds, where organic and inorganic compounds are subject to further bacterial action under aerobic conditions. At this stage the water is filtered to remove suspended solids, before allowing it to enter into a nearby stream that flows into the Kafue River.

### 2.4 Chongwe

The works components for Chongwe cover improvements to water treatment, replacement of broken pumps and pipes, plus a proposal to dredge the Chongwe Dam to increase its storage capacity. The works items are shown in Table 5 below. Likely environmental and social mitigation measures are proposed based on experience with similar activities. The exact impacts will be determined through the application of the environmental and social screening process outlined in this ESMF.

| Table 5. Chongwe Water Treatment Works and Infrastructure – Works Items |
|----------------------------|-----------------|----------------|
| **Chongwe** | **Description** | **Comments** |
| 1 | Chongwe Dam | Storage capacity | Desilting required for larger storage |
| 2 | Intake rising main | 4 new boresholes | Replace existing, complete |
| 2 | Bores | Additional 5 km mains | Dry season supply |
| 2 | Network extension | 5 demonstrations | Provide Ts & leads for future h/c |
| 2 | Sanitation | 5 km mains | Covers all types of sanitation |
| 3 | Network rehab | Water management | Repair leaks, create districts, 2.5 km |
| 5 | Network manage | Zone management (3) | District zone valves & meters |
| 5 | Customer meters | Meter all connections | Up to 1000 h/c in 3 years |
| 5 | Groundwater | Evaluate yield | Test existing well & plan extra |
| 5 | Reservoir #1 & #2 | Braithwaite 450m3 tank | Repair tank leaks, meters, valves |
| 5 | Reservoir #2 | Braithwaite 450m3 tank | Second priority repairs |
| 7 | WTP - Chemicals | Flocculation | Treatment dosing equipment |
The works items at Luangwa include the provision of an additional pump at the main intake, refurbishment of the rising main from the pump to the WTW site, refurbishment of the WTW facilities, and the addition of a supply network in a proposed housing development area. Additional work will include decommissioning of an existing borehole and connecting the borehole supply to the main WTW supply. The works items are provided in Table 6 below. Likely environmental and social mitigation measures are proposed based on experience with similar activities. The exact impacts will be determined through the application of the environmental and social screening process outlined in this ESMF.

### Table 6. Luangwa Water Treatment Works and Infrastructure – Works Items

<table>
<thead>
<tr>
<th>Luangwa</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relief Main</td>
<td>100mm GI trunk main</td>
<td>Transfer to lower zone - 2 km</td>
</tr>
<tr>
<td>2. Network rehab</td>
<td>Water management</td>
<td>Check /repair leaks, create districts</td>
</tr>
<tr>
<td>3. Network extension</td>
<td>Infills, Borehole area</td>
<td>Decommission salty supply</td>
</tr>
<tr>
<td>4. Network other</td>
<td>Road crossings leads</td>
<td>Sleeves, trench, connection leads</td>
</tr>
<tr>
<td>5. Sanitation</td>
<td>5 demonstrations</td>
<td>Covers all types of sanitation</td>
</tr>
<tr>
<td>6. District meters</td>
<td>4 x100mm; 4x75mm</td>
<td>Districts and zones</td>
</tr>
<tr>
<td>7. Customer meters</td>
<td>Meter all connections</td>
<td>250 meters, incl Ts for future</td>
</tr>
<tr>
<td>8. WTP - Chemicals</td>
<td>Flocculation &amp; Chlorination</td>
<td>Treatment dosing equipment</td>
</tr>
<tr>
<td>9. WTP - tanks</td>
<td>Lining</td>
<td>Fibre glass to prevent corrosion</td>
</tr>
<tr>
<td>10. No2 Intake pump</td>
<td>200mm submersible</td>
<td>Add to existing - 1 duty, 1 standby</td>
</tr>
<tr>
<td>11. Intake Rising main</td>
<td>1.0 km, 150 mm</td>
<td>Replace existing, with valves, meter</td>
</tr>
<tr>
<td>12. WTP - Valves</td>
<td>6 no. Process valves</td>
<td>Replace inoperable</td>
</tr>
<tr>
<td>13. WTP - meters</td>
<td>2 no meters</td>
<td>Monitor process</td>
</tr>
<tr>
<td>14. WTP - Filters</td>
<td>Filter media</td>
<td>Check filter</td>
</tr>
<tr>
<td>15. WTP - Security</td>
<td>Fencing &amp; locks</td>
<td>Prevent theft &amp; vandalism</td>
</tr>
<tr>
<td>16. Reservoir #2</td>
<td>High 40m3 tank</td>
<td>Repair and line tank leaks</td>
</tr>
<tr>
<td>17. Reservoir meters</td>
<td>2 outlet meters</td>
<td>Water measurement for management</td>
</tr>
<tr>
<td>18. Office</td>
<td>Environment control</td>
<td>Fit ceiling &amp; cross vent window, a/con</td>
</tr>
<tr>
<td>19. SCADA</td>
<td>Remote supervision</td>
<td>SCADA, telemetry, video</td>
</tr>
<tr>
<td>20. High lift pumps</td>
<td>Optimise pumps (2)</td>
<td>Replace undersize to reduce energy</td>
</tr>
</tbody>
</table>
Table codes:
2. Localised site EA to determine the need for an EIA. EMP is required
3. Highly localised site EA to determine the need for an EIA. EMP is required
5. Spot excavations and/or installations requiring an EMP
7. Spot repairs/installations above ground. Site-specific EMP
10. No EMP required

2.6 Additional Recommendations

An important issue was raised at the Stakeholders’ workshop in Lusaka (04-07-08) regarding the problem with water quality in the Chongwe Dam. The Chongwe River is fed by the Ngwerere River which flows out of Lusaka City. The water is derived from rainfall runoff and from the outflow of the Kaunda Square sewerage ponds, and the STW ponds are not functioning properly.

The refurbishment of the Kaunda Square Ponds is included in the Phase I works for the main rehabilitation works in Lusaka. However, there is scope to undertake some further investigations into the use of attenuation ponds and ‘leaky weirs’ to remove silt and to retard flash flooding. This would contribute to a significant reduction in suspended solids in the water in the Ngwerere River.

In addition, by allowing reeds and other aquatic plants to grow in the attenuation ponds, suspended organic matter will be filtered out of the water. If combined with artificial rapids (by creating weirs in narrow channel sections), the water will be increasingly aerated with higher river flow rates. In combination with clearer water and higher exposure to UV light, this type of approach will approximate natural water quality improvement processes.
3 UPDATE OF POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 World Bank’s Safeguard Policies

According to OP 4.01 Environmental Assessment, the Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally and socially sustainable, and thus to improve decision making.

EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and transboundary and global environmental aspects. EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country’s overall policy framework, national legislation, and institutional capabilities related to environment and social aspects of the country, pertaining to project activities, under relevant international environmental treaties and agreements. The Bank does not finance project activities that would contravene such country obligations, as identified during the EA.

The Bank undertakes environmental screening for each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts as follows:

**Category A:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive or sectoral EA) that includes, as necessary, elements such as environmental audits or hazard or risk assessments.

**Category B:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A. Like Category A, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

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

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

Upon screening the planned activities under WSPIP for potential adverse environmental and social impacts, it was determined that WSPIP has triggered OP 4.01 Environmental Assessment; OP 4.12 Involuntary Resettlement; and OP 7.50 Projects on International Waterways. To comply with these policies, WSPIP has prepared this ESMF and a separate RPF to ensure that future investments are implemented in an environmentally and socially sustainable manner. Both documents will be...
reviewed, approved and disclosed by the Government of Zambia and the Bank at its Infoshop prior to appraisal of this proposed project. As regards OP 7.50, the exception provision of this policy will apply to the project, and appropriate steps in compliance with this policy will be taken.

The link between OP 4.01 and this ESMF is anchored in the concept of undertaking environmental screening of each proposed project to determine the appropriate extent and type of EA. The screening requirement forms the basis of the environmental and social screening process outlined in the ESMF, and ensures that the appropriate environmental category (A, B, C, FI) is determined, and the appropriate level of environmental work is carried out based on the assigned environmental category.

Conceptually, the ESMF uses the same approach for assigning the appropriate environmental category as OP 4.01, but adapts it to the sub-project level so as to ensure speedy implementation of future sub-projects. The adaptation is reflected at the end of the Environmental and Social Screening Form (chapter 7, annex 1) where the environmental category B is subdivided into B1 (application of simple mitigation measures); and B2 (separate EA will need to be prepared for the sub-project).

The link between OP 4.01 and the requirements of national environmental legislations is established through the environmental and social screening process outlined in the ESMF which bridges the gap between the requirements of national environmental legislation and OP 4.01. National environmental legislation generally does not require the environmental assessment of small-scale sub-projects and therefore potential adverse localized environmental and social impacts cannot be identified. However, OP 4.01 requires the screening of all sub-projects to determine the requisite level of environmental work. Such an environmental and social screening process for small-scale investments is currently not available under Zambia’s environmental procedures, and therefore, the requirements of OP 4.01 will be applied to all sub-projects as described in the relevant sections of this ESMF.

The civil works components of the Project will be the main focus of the ESMF and concerns mainly rehabilitation. These works have been described in the above sections.

### 3.2 OP/BP 4.12 Involuntary Resettlement

The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure. On this last account the policy differs from that of applicable national regulations, which only legitimizes rights of those having title deeds to their properties.

This policy covers not only physical relocation, but any loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets; (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location.

This policy also applies to the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

### 3.3 Applicability of OP/BP 7.50 Projects on International Waterways

Because the town of Luangwa lies at the confluence of the Zambezi and Luangwa rivers, which also marks the border between Zambia, Zimbabwe and Mozambique the Project will trigger the World Bank Safeguard Policy OP7.50 Projects on International Waterways. The latter applies to all projects (e.g. hydroelectric, irrigation, flood control, navigation, drainage,
water and sewerage, industrial, and similar) that involve the use or potential pollution of international waterways including detailed design and engineering studies of such projects.

As the proposed water supply and sanitation improvement works will entail minimal abstraction and possible discharge of more wastewater in the future than is currently the case, the policy is triggered.

However, considering that such potential increases would not significantly increase the original design capacities of the existing system and would anyhow be extremely small in relation to river discharge, it is assumed that the project comes under exceptions to the notification requirement as follows (paragraph 7 OP7.50):

“For any ongoing schemes, projects involving additions or alterations that require rehabilitation, construction, or other changes that in the judgment of the Bank,

i. will not adversely change the quality or quantity of water flows to the other riparians; and

ii. will not be adversely affected by the other riparians' possible water use.”

3.4 Environmental Council of Zambia

The Environmental Council of Zambia has two formats for environmental assessment.

i. The first is an Environmental Project Brief (EPB), which covers small projects, and/or projects that undertake works in already disturbed areas.

ii. The second is a full Environmental Impact Assessment, which covers projects where impacts will occur to natural areas and/or to natural resources, as a result of new activities.

The regulations covering the environmental assessment are covered principally by the Environment and Pollution Control Act (1990), and for purposes of ESMF, are covered by the 1997 Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations.

Under the terms of the 1997 Regulations, the onus is on the Lusaka Water & Sewerage Company to submit a Project Brief to the ECZ outlining the activities. Thereafter, ECZ will take up to 20 days to review the project outline and determine whether an EPB or a full EIA will be required. In either case, Terms of Reference for the environmental report are developed under the ECZ guidelines.

In terms of this project, the works are covered under the EPB Requirements as described under the First Schedule of the 1997 regulations. The works schedules (as given in Table 1) are covered as indicated in Box 1.

Box 1
PROJECTS THAT REQUIRE PROJECT BRIEFS

11. Projects
   (a) Urban area rehabilitation.
   (n) Pumped storage schemes

12. Others
   (f) Projects located in or near environmental sensitive areas such as:
      (ix) areas prone to flooding and natural hazards;
      (x) water catchments containing major sources for public, industrial or agricultural uses; and
      (xi) areas of human settlements (particularly those with schools and hospitals).

The project works are expected to be covered to the largest extent through an Environmental Management Plan (EMP). This document will be guided by the ECZ 1997 Regulations, in addition to regulations covering Waste Management, Noise, Air Pollution, Water Pollution, Disposal of Hazardous Wastes (in this instance, sewerage effluent), and Control of Pesticides and Toxic Substances.
4 ENVIRONMENTAL AND SOCIAL BASELINE

4.1 Overall/ biophysical context

Lusaka is the capital city of Zambia with its climate which is typical of a sub-tropical environment and characterized by three distinct seasons: the cool dry season experienced from May to August: the hot dry season from August to November and the rainy season from November to April. The mean annual temperature ranges between 18°C and 20°C. The highest annual average temperature is 32°C and the lowest temperature averages 4°C.

Southern and south-eastern Zambia is situated on the high plateau of Central Africa, with an average altitude of 1,200 meters above sea level. The topography is flat to undulating with ridges and drainage basins, the latter which feed the Kafue River to the south of Lusaka and the middle Zambezi River system to the south-east. The altitude at river surface level on the Zambezi is approximately 360m above mean sea level.

The majority of the drainage in Lusaka flows in a northerly direction before turning to the southwest into the Kafue River. The Kafue then flows south-westwards before turning to the south east to join the Zambezi River. The exception is the Ngwerere River which flows eastwards feeding the Chongwe River, and therefore Chongwe Town and other settlements to the east of Lusaka. This river is highly polluted from its source in the City of Lusaka.

The following sections provide the background biophysical (landscapes, soils and vegetation) descriptions of each of the four project areas.

The fauna issues relating to this project have been briefly assessed, but the conditions of the affected sites are that they:

a. Are very small, being of only a few tens of metres wide, or long and very narrow, and
b. In currently disturbed environments (existing urban and peri-urban developments, or in agricultural lands).

Under these conditions, most mobile animals will be able to move away when the site is disturbed during site works. The fauna for the project areas are described for each area according to typical types of fauna that will occur, with emphasis on the possibility of species that are sensitive to disturbances.

NB. All the sites were rapidly inspected by an Ecologist with specialist knowledge of flora and fauna of the region during site visits and no endangered fauna or flora species were identified. Furthermore, the risk of disturbance/loss of rare/endangered species is also extremely low due to the existing site conditions and locations in already disturbed areas.

Kafue town

Kafue town is situated close to the foot of a low escarpment dropping down from Lusaka to the Kafue Flats floodplain. The lower areas of the town are situated on the side of the floodplain. The topography is undulating in the upper areas grading to almost flat on the floodplain.

The soils of the Kafue area are primarily determined by their position on the landscape (as for Lusaka). Soils of hills and uplands are generally shallow to moderately deep, brown to red-brown, gravelly loams to skeletal soils overlying laterite on rocky outcrops.

Soils of the mid-slopes are generally the same as those on the upper slopes, but tend to be deeper and more fertile. Around Kafue, rock formations in the middle slopes in the town appear to be creating almost horizontal benches that subcrop near the land surface. This results
in areas located up the slope in the western parts of the town having a perched water table. The low lying areas have a very shallow water table, which permeates the soil surface in some areas.

Soils of the low-lying areas are generally deep to very deep dark brown to black loamy clays to sandy clay loams. These soils are prone to seasonal water-logging leading to the development of dambos (areas with shallow to surficial water tables vegetated with wetland plants such as reeds, grasses nutgrasses [Cyperaceae] and with very few woody plants present).

**Flora:** In general though, the soils in Kafue are either gravelly laterites – on the upper lying areas or soils derived from alluvial deposition – in the lower-lying areas nearer the Kafue River. The vegetation grades from good quality Miombo woodlands (e.g. Julbernadia, Isoberlinia, Brachystegia, Albizia species) on the upper hill-slopes around the town, to Zambezi River flora on the mid-slopes dominated by Combretum (C.mossambicensis), Sclerocarya birrea, Ziziphus mucronata and Z.mauritianus, Kigelia Africana, Acacia nigrescens and Ficus species (e.g. F.verruculosa at the water's edge). The floodplain margins are dominated by wetland grasses and reeds such as Vossia (V.cuspidata), Miscanthus, Phragmites, papyrus (Cyperus papyrus) and bulrushes (Typha capensis).

**Fauna:** The of the area includes small mammals, reptiles (snakes, lizards, skinks and geckoes), amphibians (frogs and toads), insects, arachnids, molluscs, and lower order animals. The small dam will have regionally endemic fish species and other aquatic fauna and water birds.

One important additional species is the Nile Crocodile, which frequents the Kafue STW sediment and effluent polishing ponds. While these are protected species, they currently pose an environmental safety issue and will move away from the ponds as soon as mechanical excavation works begin.

**Kafue, Chilanga**

Chilanga is part of Kafue district. It is located some 20 minute drive from Lusaka on the road to Kafue. Chilanga's topography is undulating and somewhat hilly, as it lies on the upper escarpment of the high plateau on which Lusaka City is located. There are small streams flowing out of the town towards the south to south-east.

The soils of the Chilanga area (as for Lusaka) are primarily determined by their position on the landscape. Soils of hills and uplands are generally shallow to moderately deep, brown to red-brown, gravelly loams to skeletal soils overlying laterite on rocky outcrops.

Soils of the mid-slopes are generally the same as those on the upper slopes, but tend to be deeper and more fertile.

Soils of the low-lying areas are generally deep to very deep dark brown to black loamy clays to sandy clay loams. These soils are prone to seasonal water-logging leading to the development of dambos.

**Flora:** The vegetation is relic Miombo woodland that has been heavily disturbed by urban development.

The relic Miombo savanna woodland (dominated Brachystegia, Baikiaea, Pterocarpus, Azanza, Acacia, Albizia and Ficus species in particular), is more evident to the south and east of Chilanga. The natural woodlands have a canopy density varying from closed in heavily wooded areas located on hills and hill foot-slope areas, to open on the lower lying floodplain margins.
Scattered throughout the area are bush aggregations / clumps that are associated with termite mounds.

The low lying areas have typical mid-Zambezi riverine flora dominated by Acacia, Combretum and Ziziphus species. The wetlands and dambos are dominated by reeds (Miscanthus/Phragmites/Vossia associations) and bulrushes (Typha capensis).

**Fauna:** The fauna of the area includes small mammals, reptiles (snakes, lizards, skinks and geckoes), amphibians (frogs and toads), insects, arachnids, molluscs, and lower order animals. The small dam will have regionally endemic fish species and other aquatic fauna.

**Chongwe**

Chongwe is located on a small hill with moderately steep slopes in the upper area grading to almost flat in the south west of the town. The north-west of the town is incised by river channels feeding the Chongwe River.

The parent rock materials around Chongwe are undifferentiated Karroo sandstones overlain by basalt outcrops and basalt conglomerates. The soils are gravelly with poor to moderate permeability due to the high degree of rockiness in the project area. The rock formation does, however generate fertile soils for agricultural purposes.

**Flora:** The vegetation of the Chongwe area is dominated by Acacia (A.polyacantha) in the alluvial basin along the Chongwe River and its tributaries. Away from the river, the vegetation is a combination of relic Miombo Woodland, which has been heavily degraded by clearing for agriculture and peri-urban developments. Other typical plant species include Combretum species (e.g. C.mossambicensis) Ziziphus mauritiana and species associated with the flora of the middle Zambezi River system. The grasses are generally tall species such as Hyparrhenia and Hyperthelia, while the flora of the river banks is dominated by reeds (Miscanthus/Phragmites and Typha capensis). The Chongwe Reservoir is moderately infested with Water Hyacinth (Eichhornia crassipes) which is regionally proscribed water weed originating from South America.

**Fauna:** The fauna of the area includes small mammals, reptiles (snakes, lizards, skinks and geckoes), amphibians (frogs and toads), insects, arachnids, molluscs, and lower order animals. The dam will have regionally endemic fish species and other aquatic fauna and water birds.

**Luangwa**

Luangwa town is located on a small hill at the confluence of the Luangwa and Zambezi Rivers. The area is quite rocky on the hillside but grades onto a low-lying alluvial plain inland on the eastern side of the town which runs alongside the Luangwa River.

In Luangwa, to the south-east, the soils are predominantly basalt derived with alluvial and/or colluvial deposits overlying the parent rock. Closer to the river the soils are silty sands and sandy clay loams on the flat seasonal floodplains on the eastern side of the town. The northern portion is has low, rolling slopes dominated by shallow gravelly soils that are prone to erosion and desiccation. This is likely to be a result of high sodicity in the soils derived from basalt bedrock.

**Flora:** The climate is much drier than in the higher plateau areas and soils tend to be slightly alkaline and saline. The local vegetation is typical of the middle Zambezi, dominated by Baobab trees (Adansonia digitata), the ubiquitous Mopane (Colophospermum mopane), Acacia nigrescens, Sclerocarya birrea (Morula tree) various climbing shrubs such as Combretum mossambicensis, Markhamia and Lonchocarpus species, Ziziphus mucronata and Z.mauritianus, Kigelia Africana, Gibourtia coeleosperma and Markhamia species.
Fauna

*Fauna:* The fauna of the area includes small mammals, reptiles (snakes, lizards, skinks and geckoes), amphibians (frogs and toads), insects, arachnids, molluscs, lower order animals.

### 4.2 Rainfall and Hydrology

With the exception of Chongwe which drains to the Zambezi, the remaining district towns of Kafue and Chilanga to the South of Lusaka and Luangwa Bole (also termed Feira) at the confluence of the Luangwa and Zambezi rivers belong within the Kafue and Luangwa catchments. Rainfall is primarily determined by the north south movement inter-tropical convergence zone over Zambia. Early rains however are caused by the Congo air boundary resulting from the convergence of westerly winds from the Atlantic ocean with the south-east trade winds.

The mean annual rainfall in the Lusaka area, representative for Kafue/Chilanga and Chongwe as well as the central drier parts of the country, is 836 mm, 90% of which falls in the rainy season between November and March. Due to the lower elevation, about 360 compared to 1200 m above sea level near Lusaka, Luangwa experiences on average higher temperatures and less rainfall than the latter. The coefficient of variability of the rainfall is 20% while the distribution and pattern of rainfall during the season is variable and the number of rain days is approximately half the total number of days in the season. There is a tendency for the rain days to be grouped in rainy spells.

The rainy season usually begins with isolated showers from thunder storms. These may be intense and follow narrow paths. As the season progresses, these storms become less isolated with broader storm paths, but much of the total rainfall still occurs as heavy showers. Wide spread and steady rains may often follow these initial showers and link successive storms to produce rainy spells sometimes lasting several days. Intense rain during such spells may cause water logging, very high runoff and aquifer recharge. Intensities of individual storms frequently exceed 25 mm/hour and can exceed 75 mm/hour thereby causing drainage problems, with erosion along exposed slopes and overflowing of storm water drains.

Although there are no major rivers within the city, the variations in the rainfall cause related variations in stream flows and changes in the groundwater recharge storage and discharge. It has also been observed that aquifers comprising mainly fractures and dissolution features (e.g. such as the limestone and dolomites underlying Lusaka) can receive most of the annual recharge in one or two rainfall events.

### 4.3 Groundwater Resources

Groundwater resources in the Greater Lusaka area is a function of recoverable volume of water in storage in the identified aquifers and the periodic changes in this storage caused by recharge, discharge and abstraction. LWSC maintains and monitors the water quality in order to dictate its use for public, industrial and domestic supplies.

On a regional scale groundwater mainly occurs in secondary developed features such as weathered zones, joints, fractures, faults or solution features within consolidated rocks. Exceptions to this are the seasonal aquifers in the transition zone between the upper weathered soil profile and underlying parent rock, perched aquifers comprising in clay buried lenses of sand/silt and the alluvial aquifers. The latter are typically unconfined and distributed in the western part of the country and in the east around Chambeshi River and Lake Bangweulu in Northern Province and along Luangwa River in the eastern province.
The limestones and dolomites which underlie the Lusaka area, are within the current understanding of the regional hydrogeology, the only viable aquifers for large scale developments. The limestones and dolomites display strong karstic features resulting from the solution of carbonate matrix by circulating groundwater in accordance with established karstic geomorphological processes (i.e. propagation of permeability and groundwater flow is favoured along fractures/ faults and contacts with less permeable rocks).

The water supply boreholes in Chilanga are abstracting from the peripheral southern end of this aquifer, whereas the boreholes in Chongwe are developed within the harder and less permeable quartzite formation east of Lusaka.

Recharge rates have been reasonably established at 8 to 20% of rainfall for the Lusaka limestone and 1-5% for the Chongwe quartzite. In term of water quality the Lusaka limestone has harder water than that from the quartzite. Although the latter demonstrate significantly lower yield per borehole, groundwater development can still prove very advantageous as a safe water supply requiring very little treatment, but provided there are sufficient number of boreholes.

### 4.4 Catchment Hydro-Environment

There is no systematic water quality monitoring of the Kafue River and its tributaries to indicate background hydrochemistry. The sporadic water quality sampling that has been undertaken to date has been done without reference to simultaneous discharge data and does not provide a basis for definitive hydrochemical analysis. However, to enable assessment of the natural attenuation potential during transport of the sewerage between the initial and final discharge point at the STW and into the Kahe river a sampling was conducted during early July 2008. The results are shown in Table below.

A point to note is that the old final and new final effluent at the Waste water treatment plant will be combined. The “wetland” in this case deals with this effluent and the end result is TC and FC at 9, 200 and 4, 800 respectively. Adsorption, microbial processes and UV radiation as the effluent flows through the reeds therefore contributes to a substantial natural attenuation effect. This should be taken into account when designing appropriate remediation strategies.

The catchment hydro-environment including its likely influence of the on the pathogen content in the Kafue and Chongwe rivers is explained in greater detail below.

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Source</th>
<th>TC/100ml</th>
<th>FC/100ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>4844</td>
<td>Kafue wastewater (raw)</td>
<td>$7.5 \times 10^6$</td>
<td>$1.5 \times 10^6$</td>
</tr>
<tr>
<td>4849</td>
<td>Old plant final effluent</td>
<td>$5 \times 10^6$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>4853</td>
<td>New plant final effluent</td>
<td>$2500$</td>
<td>$1000$</td>
</tr>
<tr>
<td>080985</td>
<td>Sediment (ponds at Kafue WWTP)</td>
<td>$17 \times 10^6$</td>
<td>$5.5 \times 10^6$</td>
</tr>
<tr>
<td>4854</td>
<td>Nangongwe (raw)</td>
<td>$15 \times 10^6$</td>
<td>$5 \times 10^6$</td>
</tr>
<tr>
<td>4855</td>
<td>Nangongwe Secondary</td>
<td>$2.8 \times 10^6$</td>
<td>$9000$</td>
</tr>
</tbody>
</table>

**Kafue**

Influence on Pathogen Levels in the Kafue River: The hydrology of the area is important in terms of the baseline environment. The shallow water table in the upper to midslope areas of Kafue Town shed down slope via several large drainage ditches, to the low lying floodplain on
the southern side of the town. Here, rainwater flows into the floodplain reedbeds and grasslands.

The effect of the reedbeds in combination with other aquatic and semi-aquatic plants is to filter out suspended solids, often associated with faecal coliforms and other waterborne pathogenic organisms, and to expose the clarified water to UV light. UV light is a highly effective killer of waterborne pathogens, if the water is exposed to sunlight for an adequate length of time. In the case of Kafue Town the low gradient and quite long travel distance from the drainage through the reedbeds (~250-500m) at slow flow rates is highly effective in reducing the waterborne pathogens before they arrive in the main water body of the Kafue River.

**Chongwe**

The hydrology of the area is important in terms of the baseline environment. The shallow water table in the upper to midslope areas of Chongwe Town shed down slope via several large drainage lines, into the Chongwe River basin, and mainly on the upstream side of the town.

Influence on Pathogen Levels in the Chongwe Dam: The Chongwe dam is quite exposed in terms of waterborne pathogens arriving from the upstream catchment around Lusaka, and from local sources. The result is a high level of faecal coliforms and other pathogens in the water body of the Chongwe Dam.

### 4.5 Overall/ Socio-Economic Context

**Kafue, town**

Although it is still a small town relative to Lusaka, Kafue is much larger than the other small towns and has a growing industrial base. Population is estimated to be about 70,000 with over 7300 water connections in the urban areas, with a further 45,700 in peri-urban areas. There is potential for production 24,000 m³/day of treated water if electrical power is not interrupted and if the existing production and distribution system is rehabilitated.

Water is drawn from the Kafue River intake works which is located on a causeway that terminates at a canal from the river. From here water is pumped to the treatment works where it is distributed to the consumers. The water supply system is experiencing significant leakages on both the intake and distribution side, and with intermittent power, the supply is erratic. Supply is not metered at the moment.

If losses in the system are repaired and water meters are provided for volumetric charging, the availability of water will be increased considerably and could reach 24 hrs supply in most places. A waterborne sewerage network and treatment works also exists, although the breakdown of the sewer pump stations prevents this system from functioning as intended, with severe consequences for the immediate environment and the adjacent river (i.e. ponding of sewage contaminated groundwater on the surface, clogged maturation ponds with effluent discharging near the supply intake).

During the socio-economic survey and public consultations the following main issues were ascertained (e.g. a comprehensive outline is given in Appendix C and D).

- People have settled near the sewage ponds and have developed the area for agriculture (watering crops using wastewater with consequent health hazard). Compensation will be needed as they will need to move to give way for the rehabilitation works
Elsewhere in Kafue the high groundwater table complicates operation of septic tanks (i.e. they overflow)

An additional sign of poor sanitation is scattered faecal matter. Children are also reported to play with wastewater.

The number of cases of waterborne diseases (e.g., cholera, malaria, bilharzia and intestinal infections have increased substantially (e.g., see Appendix D).

**Kafue, Chilanga**

Chilanga is a township falling under Kafue district, with a substantial percentage of residents working at the Lafarge Cement Industry and government institutions. The rest of the population is involved in trading and small scale farming.

The water supply intake comprises of two boreholes; one operational whilst the other is not it was left open after sinking.

The Township of Chilanga in Kafue is experiencing a severe shortage of water, with some parts of the township such as Game and Fisheries residential area and the new 260 houses, not having any water at all. None of the available water supplied is treated; hence a high incidence of water borne and water washed diseases (see appendices C and D for details). A water committee, organized within the Chilanga community, has been established and is tasked with helping to improve the situation but it has not yet been successful. There are security problems at both the Game and Fisheries and the Chilanga main pump station, leading to thefts of water supply equipment.

Water is tapped from the borehole and pumped to the reservoir and thereafter distributed to the consumers. The water supply system is experiencing significant leakages on the distribution side, and like the case of Kafue with intermittent power, the supply is erratic. Supply is not metered at the moment.

If losses in the system are repaired and water meters are provided for volumetric charging, the availability of water will be increased considerably and could reach 24 hrs supply in most places. Only onsite sanitation system (Septic tank system) exists in Chilanga.

During the socio-economic survey and public consultations the number of issues were ascertained (refer to Appendix C and D).

**Chongwe**

The small town of Chongwe is located about 45 km East of Lusaka on the road to Chipata in the Eastern Province. Chongwe has an estimated population of about 18,000 people. The main sources of livelihood for the people of Chongwe includes trading, charcoal production, and small scale farming. Vegetable gardening using water from Chongwe River, is also an important income generating activity.

Water supply is unreliable and is not treated at all in spite of high turbidity and coliform count, which breeds communicable diseases as illustrated in the Appendices C and D). There are some unconnected hand pumps in the area, but the groundwater quality is poor and coliforms are evident. Sanitation is provided by onsite sanitation.

Chongwe has very poor water quality and sometimes seasonal shortages as well. The source of raw water is a dam in Chongwe River which is heavily impacted by the upstream discharges of sewage water from the Kaunda Square treatment ponds for Lusaka. In addition it needs to
be upgraded to reduce the risk of shortages. The storage reservoir and distribution system are run down and have significant leaks.

In the peri urban areas, most people depend on shallow wells for their drinking water which also contributes to the water born and water washed diseases (refer to the Appendices C and D).

During the socio-economic survey and public consultations the number of issues were ascertained (refer to Appendix C and D).

Luangwa
Luangwa is located about 330 km East of Lusaka with a population of approximately 18,000 people. The town is at the confluence of the Zambezi and Luangwa rivers, and is situated where the borders of Zimbabwe and Mozambique meet with Zambia. Most of the people are small scale farmers, growing mainly maize, ground nuts and sorghum. Fishing and craft work are also an important source of livelihood.

The available ground water is salty and hence boreholes are not acceptable to consumers for drinking water. Water abstracted from the Zambezi is currently not treated and results in an unsafe and turbid supply, contributing to the high prevalence of water born and water washed diseases, as shown in appendices C and D) Although a number of residents have connections, estimated at 200, there are areas such as Soweto and Kamoba, that are not connected and rely on salty borehole water, which is believed to be contributing to the high prevalence of stained teeth. The network is vulnerable to damage because the pipes are not buried.

During the socio-economic survey and public consultations the number of issues were ascertained (refer to Appendix C and D).
5 THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PROCESS

5.1 Consultant’s Approach to the ESMF Process

Overall

The proposed project falls under World Bank Environmental Category B, and is confined to the districts of Kafue, Chongwe and Luangwa. Under National regulations the work proposed falls under the category requiring an Environmental Project Brief. However, as discussed earlier, the WSPIP will apply the environmental and social screening process to close the gap between Zambia’s environmental regulations and the Bank’s OP 4.01 which requires the screening of all sub-projects for potential adverse environmental and social impacts.

The Consultant also examined the possible need for compensation as a result of works associated with the project in the light of World Bank OP and BP 4.12. In case the latter is triggered reference is made to the Resettlement Planning Framework (RPF) for more detailed description of the guidelines to be adhered to. These policy guidelines are essentially those in place currently at LWSC and based on the Water and Sanitation Act of 1997 as well as other Acts. The RPF is a separate document and is disclosed at the same time the ESMF is disclosed.

The ESMF was prepared with an initial scoping study to review the type of work that will be conducted under the rehabilitation and extension works undertaken. Essentially, the Environmental scoping study assessed all the elements as described by the Lusaka Water and Sewerage Company.

Following the scoping study, further investigations were conducted at the representative sites where the works are required. In addition to site inspections, consultations were carried out with the LWSC Engineering Section about the proposed methodology for construction and/or rehabilitation and with the Area and Site Managers.

Fieldwork undertaken consisted of visits to representative sites accompanied by LWSC field staff, to assess the extent of probable impacts at each representative rehabilitation site. Digital photos were taken of the areas to indicate the typical conditions in the works areas, and GPS readings were taken, to verify the locations as shown on the LWSC GIS System (see Appendix 3 for works locations).

Impact Assessment Criteria

Following the description of the inherent environmental and socio-economic conditions at each works site, the following framework of key determinants based on the typical impact evaluation criteria (extent, duration, intensity, probability, mitigation potential and significance) was used to assess impacts and resulting mitigation measures.

Emphasising initially the specific impacts that are likely to result from the nature of works (e.g. trenching, excavation, site-rehabilitation) and works category (e.g. water supply, sewerage etc), the Environmental and Social Screening Form in chapter 7 – annex 1 (to trigger preparation of specific sub-project mitigation measures (B1) or separate EIA reports (B2) early on in the project cycle) including summary matrices (of impacts and mitigation measures) to serve as the Environmental and Social Checklist (tables 11-14) that were prepared for the original project are updated in this ESMF to reflect the current situation. Subsequently, to provide guidance on minimizing adverse impacts on potential erosion, loss of vegetation, assets and / or relocation, impacts and mitigation measures are included as part of the ESMP in the chapter to follow.

i. Biophysical factors
Fauna
- Rare/endangered species
- Nesting/roosting/movement
- Benefit/decrement of changed habitat
- Exposure to contaminants (e.g. sewage, herbicides, spills of fuel/lubricants)

Flora
- Vegetation removal
- Conservation status
- Presence/threat of alien species
- Economic value
- Debris disposal
- Herbicide use
- Exposure to contaminants (e.g. sewage, herbicides, spills of fuel/lubricants)

Physical factors
- Soil/bedrock exposure, erosion
- Terrain, soil stability/slope
- Wetlands/drainage lines
- Weather conditions
- Geotechnical aspects
- River crossings

ii. Socio-economic factors

Land use
- Existing land use
- Future land use
- Tenure

Visual
- Homo/heterogeneous landscape/aesthetics

Stakeholders
- Consumer - Economic development
- Landowner - Property value

Community
- Consumer behaviour
- Cultural resources/amenities
- Resettlement/Compensation
- Labour
- Public services
- Public Safety

5.2 Environmental and Social Management Plan

The project is intended to result in a net positive environmental impact on the residents within the 3 district towns of Chongwe, Luangwa and Kafue. Where negative environmental impacts are expected within the scope of the works they will be experienced during the rehabilitation/construction phase.

To help offset any potential negative impacts the main focus of this study will be on the project Environmental and Social Management Plan (ESMP). Box 2 sets out the framework for an ESMP, while table 15 outlines the detailed institutional arrangements for its implementation.
In the course of preparing the ESMP, the Consultant has identified the need for increased effort and cost to mitigate the impacts, and an increased effort to ensure that the ESMP is fully implemented by the organisation contracted to undertake the civil and mechanical works (the Contractor, e.g. see ESMP in table 15).

**Box 2**

**The environmental and social management plan (ESMP)**

Reducing potential negative impacts to a tolerable level during the construction phase especially is the purpose of having an environmental and social management plan (ESMP). The ESMP sets out what should be done (and what should not be done) and how those actions should be performed to avert environmental harm or to keep it to an acceptable minimum.

The main responsibility for producing the ESMP falls on the project proponent. This responsibility is fulfilled:

- by ensuring that social and environmental aspects are integrated with project planning and design;
- by attaching Environmental Guidelines for Contractors to the bidding documents to ensure that environmentally and socially sustainable construction methods are adopted;
- through regulation and supervision of the contractors during the tender and construction; and;
- by observing approved measures throughout the operational period.

### 5.3 Monitoring Schedule and Guidelines for Contractors

To ensure that the ESMP is adhered to a monitoring schedule has been provided, with recommendations included for identifying the person(s) responsible for checking on the Contractor that the EMP is implemented (e.g. see table 15 and monitoring section in chapter 8).

To ensure that the Contractor is able to comply with the ESMP effectively it – along with the Environmental Guidelines for Contractors (chapter 7, annex 4) - should become part of the special conditions of contract and the Contractor must include adherence to the specifications in their bid (the cost of mitigation is therefore assumed under the contractor’s price proposal).

To assist this process, the ESMP is written in a format that will provide guidelines to be included with the tender documents.

### 5.4 Public Consultation

The public consultation and awareness programme has involved a 3 tier process:

i. Informal meetings held at community level in the areas of works
ii. Ad hoc discussions with key Government agencies and NGOs as appropriate
iii. A formal workshop for key stakeholders held to present the draft report findings
Informal meetings with community leaders in affected areas have ensured that people who will be affected by the works programme are both aware of the impending project and are aware of the probable effects. Any comments or concerns raised by the community at this stage have been incorporated into the ESMP where they are relevant.

During the ESMF-process, public consultations have been held during meetings and representative site visits together with LWSC. These meetings and site visits helped to determine the proposed scope of works and the LWSC’s intended work methodology. These were used to determine the probable impacts on the physical and social environment.

In addition to the representative site inspections and consultations within the LWSC, extensive consultations were carried out with people from different departments within Government Ministries and Departments, and with representatives of communities that may be affected by the rehabilitation works programme. These were conducted by the Consultant’s Sociologist and Community Health and Safety Specialist (results are included in Appendix C).

Additional communications were held with the Environmental Council of Zambia regarding the expected levels of impacts and proposals to cover the likely approach of the ESMF, mainly through an ESMP and recommendations contained in the Environmental and Social Screening Form (annex 1, chapter 7).

### 5.5 Summary Findings from the Social Awareness and Public Health & Safety Meetings

The critical issue with this project is that the “No Project” option will result in increasingly deteriorating health and social conditions in the four target project areas.

Additionally, the issue of water quality in the Chongwe Dam was raised at the stakeholder’s workshop in Lusaka on 4th July 2008. Specifically, the urgent need to treat the upstream contamination of the Chongwe river from the Lusaka STW at Kaunda Square was emphasised in order to validate expenditure on any dredging works proposed for the Chongwe Dam.

The below table summarises the issues and concerns raised by communities in the proposed areas of works. Full report-backs are provided in Appendix C.

#### Table 8. Summary of Major Issues Raised at Community Meetings

<table>
<thead>
<tr>
<th>Major Issue</th>
<th>Community Location</th>
<th>Works Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbance of water supply (threat to disease out breaks from either drinking water from un safe sources, no water for flush toilets)</td>
<td>C5, C6, Shikoswe, Zambia compound (in Kafue town), Luangwa boma, Kamoba, Soweto compound – Luangwa, Chilanga township</td>
<td>At construction stage</td>
</tr>
<tr>
<td>Disturbance of sewer network (threat to disease outbreaks, exposure to bad smell)</td>
<td>Nangongwe, Kafue estates, Zambia compound, Kafue town, Shikoswe</td>
<td>In the initial stage</td>
</tr>
<tr>
<td>Loss of business</td>
<td>Kafue town market, Luangwa market and along streets with tukTuks (make shifts/vendors) i.e. where rehabilitation works will take place (in all district towns)</td>
<td>Prepare and implement RAP prior to construction stage</td>
</tr>
<tr>
<td>Uncovered trenches/holes for too long, standing water, threat of diseases e.g. Cholera and Typhoid, mosquitoes and other pests can breed here, accidents to children, people walking at night, murder, dumping of babies, becoming rubbish pits</td>
<td>All</td>
<td>Construction stage</td>
</tr>
<tr>
<td><strong>Major Issue</strong></td>
<td><strong>Community Location</strong></td>
<td><strong>Works Stage</strong></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Work taking too long</td>
<td>All</td>
<td>Construction stage</td>
</tr>
<tr>
<td>Demolishing/breaking up of peoples wall fences and extensions.</td>
<td>Shikoswe, Nangongwe, Kamoba in Luangwa,</td>
<td>Prepare and implement RAP prior to construction stage</td>
</tr>
<tr>
<td>Inconvenience to motorists and pedestrians (uncovered trenches).</td>
<td>Kafue estates, Kamoba, Shikoswe, Chongwe new area, Chongwe secondary school, Nangongwe,</td>
<td>Construction stage</td>
</tr>
<tr>
<td>Compensation of affected people</td>
<td>Shikoswe, Nangongwe, Kamoba in Luangwa,</td>
<td>Prepare and implement RAP prior to construction stage</td>
</tr>
<tr>
<td>Employment opportunities for local people (positive)</td>
<td>All</td>
<td>During construction</td>
</tr>
<tr>
<td>Improved quality of life from improved sewer network and water supply (no more threat of diseases, no more bad smell from blocked sewer pipes and man holes, access to safe drinking water continuously etc.)</td>
<td>All</td>
<td>After rehabilitation is completed.</td>
</tr>
<tr>
<td>Boost of business for landlords, as more people will want to come and rent houses. Boosting of business</td>
<td>Kafue- Zambia compound, Nangongwa and Kafue Estates</td>
<td>After rehabilitation is completed</td>
</tr>
<tr>
<td>Loss of farm land</td>
<td>Kafue and Chongwe</td>
<td>During construction</td>
</tr>
</tbody>
</table>

5.6 **Community Concerns**

The issue of risk of damage and/or destruction of property was raised during the public meetings. The locations where this is likely to occur most are in very narrow confines where pipelines need to be excavated, and where new pipelines are to be installed. The period when most problems will be encountered is when excavation works are taking place.

To deal with this problem, the Contractor must be made aware of locations where damage to property is most likely to occur, and should adjust the working method to minimise/avoid damage to property. Where damage cannot be avoided, the first course of action will be to follow guidance set forth in the Resettlement Policy Framework (disclosed separately) in compensating damages.

The Consultant discussed the procedure for assessment of compensation with LWSC, Lusaka City Council, the Ministry of Local Government and Housing and the Ministry of Works and Supplies, Buildings Department. As no standard schedule of compensation rates exists any compensation claims will need to be handled on a case by case basis according to the policy set out in the Resettlement Policy Framework (disclosed separately)

5.7 **Concluding Remarks**

The project works will benefit the residents of the four target project areas. The aim of the ESMF has been to identify any unintended impacts associated with development and then to suggest how they can be minimised through effective environmental management.

The physical consequences of the type of works identified so far on private property are likely to be limited to the inconvenience of obstructed access, noise and dust during the construction works. In addition some wall fences will probably need to be dismantled and gardens are likely to be disturbed as part of replacing the connection pipes. However not all areas of work
have been defined. Should damage occur to assets or should people's livelihoods be disrupted, the process for establishing compensation is set out in the RPF.

The more adverse environmental impacts are likely to be associated with the replacement of sewage pipes and removal of potentially highly sewage contaminated silt from the maturation ponds in Kafue and dam in Chongwe. Whether the silt will be used/composted on-site or removed will depend on its quality, which will be tested prior to undertaking the works.

Emphasising initially awareness of public health and safety the EMP outlines the arrangements for compliance monitoring, responsibilities and tasks to be undertaken by the Client's representatives (e.g. Environmental Management Officer) and Contractor to minimise adverse impacts and enhance benefits. From the impact assessment carried out the environmental acceptability of the project may be summarised thus:

**Biological Environment**
Terrestrial Ecology. Very minor negative impacts; all capable of being reduced to an acceptable level through environmental management planning.

Aquatic Ecology. No significant negative impacts on the Kafue River or on water courses in and around Lusaka.

**Physical Environment**
Water Quality: No negative impacts.

Air Quality: Minor negative impacts associated with dust and machine fumes from construction works.

Landscape: Very small-scale and largely temporary negative impacts associated with works areas.

**Socio-Economic and Cultural Environment**

- Minor short-duration socio-economic impacts associated with construction works.
- Limited compensation expected where gardens, fences might have to be removed to give way for the construction works or where the rehabilitation will displace livelihoods (e.g. Kafue residents within buffer zone of maturation ponds and brick making within Chilanga estates water works)
- Mitigation possible through an effective environmental management plan and the resettlement action plan prepared based on resettlement policy framework

**Key Institutional Stakeholders**
A list of key institutional stakeholders consulted has been drawn-up mainly from the statutory entities that will directly and/or indirectly have some interest in the Works Programme. These are listed in Table 2 below.
Table 9. Key Institutional Stakeholders

<table>
<thead>
<tr>
<th>Stakeholder Institutions</th>
<th>Affiliate Contact Agency or Department</th>
<th>Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Ministries and Departments</td>
<td>Ministry of Tourism, Environment and Natural Resources</td>
<td>Director, Environment</td>
</tr>
<tr>
<td>Ministry of Local Government and Housing</td>
<td>Director, Department of Infrastructure Support Services DISS</td>
<td>Director, Department of Infrastructure Support Services DISS and Department of Settlements</td>
</tr>
<tr>
<td>Lusaka City Council</td>
<td>Director, Town and Country Planning</td>
<td>Director, Town and Country Planning</td>
</tr>
<tr>
<td>Ministry of Agriculture and Cooperatives</td>
<td>The Director, Department of Agriculture</td>
<td>The Director, Department of Agriculture</td>
</tr>
<tr>
<td>Ministry of Energy and Water Development</td>
<td>Department of Water Affairs</td>
<td>Director of Water Affairs</td>
</tr>
<tr>
<td>Ministry of Energy and Water Development</td>
<td>Water Development Board</td>
<td>The Secretary of the Board</td>
</tr>
<tr>
<td>Ministry of Energy and Water Development</td>
<td>Water Resources Action Programme</td>
<td>The Programme Manager</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Lusaka Urban Health Management Board</td>
<td>Environmental Health Expert</td>
</tr>
<tr>
<td>Ministry of Lands</td>
<td>Lands Department</td>
<td>Commissioner of Lands</td>
</tr>
<tr>
<td>Ministry of Lands</td>
<td>Lands Department</td>
<td>Surveyor General</td>
</tr>
<tr>
<td>Statutory Bodies and parastatals</td>
<td>National Water and Sanitation Corporation NWASCO</td>
<td>The Director</td>
</tr>
<tr>
<td>Zambia Electricity Supply Corporation ZESCO</td>
<td>Environment Section, Construction Department</td>
<td></td>
</tr>
<tr>
<td>Environmental Council of Zambia ECZ</td>
<td>Inspector EIA</td>
<td></td>
</tr>
<tr>
<td>National Institute for Industrial and Scientific Research</td>
<td>Water Resources Research Unit</td>
<td>The Head of Section</td>
</tr>
</tbody>
</table>

5.8 GIS Data and Mapping

LWSC has very little available data on the water and sanitation layouts for the 3 towns project.

As a result of this, groundwork was conducted using hand-held GPS and downloading GPS points onto Google Earth + software and imagery. The accuracy of the GPS readings was generally within 5 metres. While this level of accuracy is fine for indicating the locations and layouts of the infrastructure for EA purposes, it may be and invalid process for detailed design layouts.

The imagery, in conjunction with ground-based photography at the different sites visited has been used to depict the typical conditions and to show the fragmented layouts of the different elements of the refurbishments and upgrading works in the 4 project areas.
6 POTENTIAL IMPACTS AND CONVENTIONAL MITIGATION MEASURES

6.1 Methodology

The conventions used for the assessment of impacts are summarised in Table 9 below. The resulting assessments are structured with initial emphasis on the proposed water supply and sanitation refurbishments, repairs and upgrading works.

Listed below are the general impacts, which form the basis of the works reviewed in this ESMF-document.

- Installation of extensions to the water supply networks in the project areas
- Repairs to water treatment and storage facilities (including dredging of the Chongwe dam) along with upgrading of the chemical treatment facilities in all project areas
- Installations and repairs of pipes and electrical and mechanical components in the Kafue sewerage management network
- Long-overdue maintenance to sanitation works sewerage treatment ponds in Kafue Town form.

The main impacts where they may occur are within existing amenities areas, or, alternatively in new housing areas that will develop prior to the installation of the water supply networks that feed these areas.

The impacts have been graded according to the extent of area (environmental footprint) that will be affected by the works as well as the area that may occur in terms of an affected zone around the specified works areas. The assessment tables are ordered from works components with the least impacts and smallest areas affected, thus requiring very little mitigation, to those with the highest level of impact (within the scope of this project) and which require a more extensive set of mitigations and a more rigorous ESMP. This order has been selected to highlight the limited extent of the majority of works items.

Methodology and rates for determining compensation to landowners/users for temporary land-take during the on-site excavation/installation works are described as part of RPF in Appendix D.

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3 The term land-users is preferred for works in Chongwe at the borehole site, in Chilanga along the rising main pipeline, and at the Kafue Sewerage Treatment Plant because the land has been used without prior council authorisation and falls within the amenities area/corridor set aside for the sanitation works and/or for water and electricity supplies.
Table 10. Summary of conventions used for impact assessment

<table>
<thead>
<tr>
<th>Descriptive adjective</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status:</strong></td>
<td>Nature of the impact.</td>
</tr>
<tr>
<td>- Positive.</td>
<td>- Beneficial environmental change.</td>
</tr>
<tr>
<td>- Negative.</td>
<td>- Adverse environmental change.</td>
</tr>
<tr>
<td><strong>Extent:</strong></td>
<td>The area affected by the impact.</td>
</tr>
<tr>
<td>- Local.</td>
<td>- Proposed Development Block.</td>
</tr>
<tr>
<td>- Regional.</td>
<td>- Surrounding Districts/ villages.</td>
</tr>
<tr>
<td>- International.</td>
<td>- Adjacent countries</td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
<td>The period over which impacts will continue.</td>
</tr>
<tr>
<td>- Short-term.</td>
<td>- Within a period of 6 months.</td>
</tr>
<tr>
<td>- Medium-term.</td>
<td>- Within a period of 6 months to 2 years.</td>
</tr>
<tr>
<td>- Long-term.</td>
<td>- For the lifecycle of the project.</td>
</tr>
<tr>
<td>- Permanent.</td>
<td>- Permanent – residual impacts.</td>
</tr>
<tr>
<td><strong>Intensity:</strong></td>
<td>The severity of impact on the site.</td>
</tr>
<tr>
<td>- Low.</td>
<td>- Impact of low severity - minor effects.</td>
</tr>
<tr>
<td>- Medium.</td>
<td>- Medium severity - major effects.</td>
</tr>
<tr>
<td>- High.</td>
<td>- High severity impacts.</td>
</tr>
<tr>
<td><strong>Probability:</strong></td>
<td>Description of the likelihood of impact occurring:</td>
</tr>
<tr>
<td>- Definite.</td>
<td>- Define.</td>
</tr>
<tr>
<td>- Highly probable.</td>
<td>- Most likely.</td>
</tr>
<tr>
<td>- Probable.</td>
<td>- Distinct possibility.</td>
</tr>
<tr>
<td>- Improbable.</td>
<td>- Unlikely to occur.</td>
</tr>
<tr>
<td><strong>Confidence:</strong></td>
<td>Degree of confidence in predictions.</td>
</tr>
<tr>
<td>- Low.</td>
<td>- Poor confidence that predictions will occur.</td>
</tr>
<tr>
<td>- Medium.</td>
<td>- Good confidence that predictions will occur.</td>
</tr>
<tr>
<td>- High.</td>
<td>- Certain that predictions will occur.</td>
</tr>
<tr>
<td><strong>Significance:</strong></td>
<td></td>
</tr>
<tr>
<td>- No significance.</td>
<td>- Requires no further investigation, no mitigation or management.</td>
</tr>
<tr>
<td>- Moderate significance.</td>
<td>- Requires mitigation and management to reduce impacts to acceptable levels (if negative).</td>
</tr>
<tr>
<td>- High significance.</td>
<td>- Should influence a decision about the project if the impact cannot be mitigated or managed.</td>
</tr>
</tbody>
</table>

6.2 Overall

Overall, once the works are completed, there will be a significant net positive social and environmental benefit to the people in the concerned districts of (Chongwe, Luangwa and Kafue).

However, limited negative environmental and social impacts will occur for short periods. Through environmental and social screening for potential adverse environmental and social impacts at the actual sub-project site, and careful pre-planning by the organisation contracted to undertake the rehabilitation works all the negative impacts can be addressed through the identification, implementation and monitoring of appropriate environmental and social mitigation measures (table 15). Alternatively, the no-project option will result in rapidly deteriorating living conditions and community health standards within the 3 district towns. The associated costs to society in terms of health impact and lost productivity are most likely significantly larger than the subsidies with providing safe water supply and sanitary drainage.

The bulk of the impacts fall under Construction phase works, mainly trenching and excavation works. There are two categories of trenching works, firstly water supply lines, and secondly
sewer pipelines. The latter, however, only applies to Kafue as the remaining areas will emphasise demonstrations of various on-site sanitations solutions.

The water supply lines are mainly small diameter, especially in the peri-urban settlements, where the longest sections of pipeline are to be installed. The trenches will mostly be up to 1.5m depth and approximately 0.5m wide. The resulting 'footprint' of disturbed land will therefore only be of the order of 2-3 metres wide for small-bore pipelines, and up to 5-6 metres wide at most, for large-bore pipes laid in trenches 2-3m deep and 1.5-2 m wide. This will accommodate the topsoil spoil on the outer side and the excavated trench material placed next to the open trench for immediate backfill.

The secondary or indirect impacts of the trenching works will be disruptions to traffic, pedestrians, and safety issues where trenches are located along pedestrian pathways and where they may block access to private and/or public property in both residential and commercial areas. There are also concerns that trenching if conducted during the rainy season or if left open for too long can provide (i) favourable conditions for breeding of mosquitoes (and thus spreading of disease) and (ii) dumping grounds for rubbish.

The severity and duration of these impacts can be minimized by ensuring that the excavation and construction works are limited to short working sections, and that works are carried out rapidly and efficiently.

The remainder of the impacts will be site specific, and generally within the LWSC operating sites. In this regard it is particularly the dredging of the sewage maturation ponds in Kafue and reservoir in Chongwe as well as the excavations/ emptying of blocked sewer pipes that will need an ESMF.

The Environmental and Social Management Plan (ESMP – table 15) for the project has been drawn up according to the anticipated impacts from the rehabilitation works and subsequent operating phases.

6.3 Impacts Anticipated During the Works

There are a number of impacts that should be expected during the rehabilitation works programme. These are listed below:

Trenching and other Excavation Works:
- Noise, damage to property, danger to traffic due to rock blasting and dust created during excavation
- Disruption to traffic – mainly detours and hold-ups where trenches cross major routes and residential area access
- Destruction of property, e.g. walls, buildings, gardens, property access driveways, churches, markets, informal settlements
- Destruction of vegetation - trees, woodlands, gardens landscapes, parks, etc
- Disruption to pedestrian walkways
- Danger of people, traffic falling into trenches
- Storm-water entrainment in trenches on steep slopes and ponding on level ground
- Damage to adjacent services e.g. to sewer lines where water pipelines are being excavated
- Odours released where sewer lines are excavated, plus potential hazard of raw sewerage being released – particularly in urban and peri-urban areas, soil contamination and spread of diseases e.g. cholera, dysentery, typhoid
• Disruption to other services in narrow servitudes, e.g. power supplies, telephone lines, storm-water drains blocked by soil stockpiles, etc.
• Soils replacement methodologies to ensure rapid rehabilitation of works areas – including road and storm-water drainage repairs
• Landscape rehabilitation works to be completed as rapidly as possible

Rehabilitation of Site-Specific Works, Such as Reservoirs, Sewerage Maturation Ponds, Lift-Pump Stations Etc:
• Noise and dust created during excavation
• Additional land requirements where existing facilities cannot contain the extension works
• Disposal of sewerage sludge
• Inadequate storage for sewerage treatment during and/or immediately after high rainfall storms
• Contamination of surrounding drainage lines and major rivers
• Potential contamination of ground water supplies
• Spread of diseases
• Hazards associated with working in these places
• Soil and landscape rehabilitation after works are completed

Operating Phase Activities:
• Pipeline monitoring, localised repairs
• Demarcation of pipelines
• Water supplies operation
• Borehole testing for groundwater contamination
• Sewerage ponds inflow and outflow quality testing
• Extent of areas impacted by discharge of sewerage into river catchments during high rainfall runoff periods

Tables 10 to 13 in the following pages reflect the types of impacts and how these will be dealt with. The tables have been presented according to the works items with the lowest impacts first. This order has been selected to highlight the limited extent of the majority of works items.

6.4 Impacts on Hydrology

Most of the impacts on surface water will be short term during the construction phase and of negligible significance. Despite the fact that the proposed rehabilitation works will result in more water being drawn from the rivers and boreholes than is the case today, these additional abstractions are negligible compared to the seasonal river flows.

On the side of potential negative impacts of waste water generated during the works period, particularly with regard to sewer line rehabilitation, events may result in contaminated water mixing with clean surface water supplies in the urban areas (see Trenching and other Excavation Works, 6.3 above).

The current situation for example in Kafue, however, is that the failure of the pump stations along the sewer lines already results in a constant flow of large quantities of raw sewerage into the urban drainage system.

The sewage treatment ponds in Kafue town receive final effluent from the activated sludge treatment. The purpose of the ponds is to remove pathogens and faecal coliforms from the
final effluent before finally discharging the 'polished' effluent into the artificial wetland and then into the Kafue River.

The ponds are currently characterized by excessive growth of water plants and the ponds have silted-up due to excessive sludge accumulation as they have not been desludged for more than five years.

The sludge is Faecal Sludge (FS) generated from wastewater originating from sewered family and public toilets as well as aqua privies and septic tanks which are emptied by vacuum tankers and the effluent discharged at the sewage treatment plant. Kafue town has a number of industrial plants notably the fertilizer production plant, a brewery, yeast making plant and a textiles manufacturing plant. All these plants do not discharge their effluent into the sewer network as they have their own pre-treatment units.

With little or no industrial effluent, it is expected that heavy metals are in trace amounts in the FS. The FS in the ponds can be termed as weak sludge as it has been stored (accumulated) for a lengthy period of time and hence, undergone biochemical stabilization to a considerable degree.

During rehabilitation works, the ponds will be desludged and the sludge will be hauled to approved landfills on the outskirts of Kahe town. These are located to the north of the town off Kafue road.

In view of the importance of maintaining environmental flows in the River the Consultant has analysed the impact on the hydrology of additional abstraction of 45 Ml/d from the River. A simple model has been established to indicate environmental flow (EFR) requirements and then the current and predicted flows have been superimposed upon that.

Figure 1 illustrates the results of the hydrological analysis and as can be seen the additional abstraction has a negligible effect on the River hydrograph (the graph line for existing flow downstream almost indistinguishable from the line showing flow after rehabilitation).

![Figure 1. Hydrological Analysis of Rehabilitation Works on Kafue River (from Source)](image-url)
7 The Environmental and Social Screening Process

This chapter outlines the institutional arrangements for the implementation of the environmental and social screening process for future sub-projects. This screening process can also be applied to planned investments under the ongoing operation.

Step 1: Environmental and Social Screening of Sub-Projects

Environmental and Social Screening Form (Annex 1 below). This form will be completed at the sub-project planning stage as follows: (i) LWSC's Environmental Officer will complete the form in consultation with the relevant stakeholders, including potentially affected persons.

Step 2: Assignment of the Environmental Category

The World Bank will assign the environmental category adapted to the requirements of OP 4.01 as follows:

Environmental category B1: Sub-projects in this environmental category are expected to have limited environmental and social impacts, and therefore, the application of simple mitigation measures as per Environmental and Social Checklist (tables 11-14 of the ESMF) are likely to suffice.

Environmental category B2: Sub-projects in this category will require a separate EIA to get a better understanding of the potential environmental and social issues that have been identified in the screening process. With assistance from LWSC’s Environmental Officer, sub-project implementers will arrange for the preparation of a separate EIA report; draft EA terms of reference are provided in annex 5 of this chapter.

Environmental category C: Sub-projects in this category are likely to have minimal or no adverse environmental impacts. No additional environmental work will be required and sub-project implementation can proceed.

Note: Since WSPIP has been assigned the environmental category B, sub-projects that have been assigned the environmental category A cannot be supported under the proposed operation. These sub-projects would either have to be redesigned and rescreened or abandoned.

Step 3: Environmental Work

(a) Use of the Environmental and Social Checklist (tables 10-13) This checklist provides guidance regarding the application of simple environmental and social mitigation measures for category B1 sub-projects. It will be adapted to the particular requirements of the sub-project by qualified personnel. The ESMF, table 15, provides information on the institutional arrangements for the implementation and monitoring of mitigation measures; this information will be adapted to the specific requirements of the sub-project.

(b) Carrying out a separate EIA: In cases where the environmental screening results indicate the need for a separate environmental impact assessment (EIA) the LWSC’s EMO will adapt the draft EA terms of reference (annex 5 below) to the sub-project under consideration. Qualified, independent Environmental Consultants will be hired by the sub-project implementers to carry out this environmental impact assessment according to Zambian environmental laws and regulations. Copies of the EIA reports will be forwarded to (i) the ECZ; and (ii) the World Bank for review, clearance and disclosure prior to the commencement of civil works.
(c) **The Bank’s Safeguard Policies:** These policies need to be taken into account during the environmental and social screening process to ensure that future sub-projects are implemented in compliance with the Bank’s safeguard policies. The summary (annex 3 below) proposes steps to be taken in the event that additional safeguard policies are triggered by future sub-projects. However, alternative steps can be taken provided they are in compliance with these safeguard policies.

**Step 4: Review and Clearance**

**Review and Approval Process for Sub-Projects:** (a) The environmental and social screening results of sub-projects will be forwarded to the ECZ for review and clearance. Timely review and clearance of the screening results is of critical importance to avoid any delays in the implementation of sub-projects. (b) Separate EIA reports prepared for sub-projects will be forwarded to the ECZ for review and clearance. Copies of the EIA reports will also be sent to the Bank for review, clearance and disclosure. Subsequently, the final EIA reports will be disclosed in Zambia and at the Bank’s Infoshop prior to the commencement of civil works.

**Step 5: Public Consultations**

Public consultations will be carried out in the course of the environmental and social screening process. The Environmental and Social Screening Form requires the documentation of the results of public consultations and participation. The public consultations will be carried out according to Zambian laws:

The Zambia’s public consultations, according to the ECZ Environmental Impact Assessment (EIA) procedures manual Part III Section 10:

1. “The developer shall, prior to the submission of the environmental impact statement to the council, take all measures necessary to seek the views of the people in the communities which will be affected by the project.
2. In seeking the views of the community in accordance with sub-regulation (1), the developer shall:
   a. Publicize the intended project, its effects and benefits, in the mass media, in a language understood by the community for the period not less than fifteen days and subsequently at regular intervals throughout the process; and
   b. After the expiration of the period of fifteen days, referred to in paragraph (a), hold meetings with the affected communities to present information on the project and to obtain the views of those consulted.

**Step 6: Environmental Monitoring**

The LWSC EMO will carry out the environmental monitoring at the sub-project sites. The environmental monitoring of sub-projects will take place on a “spot check” basis as it would be impossible to monitor all sub-projects. These checks will aim at controlling the actual implementation of mitigation measures, at both, construction and operations phases. Environmental monitoring needs to be mainstreamed in the overall Monitoring and Evaluation (M&E) system of the WSPIP.

**Step 7: Monitoring Indicators**

The arrangements for monitoring during the construction phase are proposed in chapter 8. Monitoring indicators should include (i) water quality; (ii) soil erosion; (iii) vegetation changes; and (iv) water use and availability of safe drinking water.
ANNEX 1: PROPOSED ENVIRONMENTAL AND SOCIAL SCREENING FORM

The Environmental and Social Screening Form (ESSF) has been designed to assist in the evaluation of sub-projects of the Water Sector Performance Improvement Project (WSPIP) in Zambia. The form is designed to place information in the hands of sub-project implementers and reviewers so that impacts and their mitigation measures, if any, can be identified and/or that requirements for further environmental analysis be determined.

The ESSF contains information that will allow reviewers to determine the characterization of the prevailing local bio-physical and social environment with the aim to assess the potential sub-project impacts on it. The ESSF will also identify potential socio-economic impacts that will require mitigation measures and/or resettlement and compensation.

Name of sub-project: ............................................................

Sector: ............................................................................

Name of the district/city: ....................................................

Name of Implementing Agency: ...........................................

Name of the Approving Authority: ......................................

Name, job title, and contact details of the person responsible for filling out this ESSF:

  Name: .............................................................................

  Job title: ..........................................................................

  Telephone numbers: .......................................................;

  E-mail address

  Date:

  Signature: .................................................................
PART A: BRIEF DESCRIPTION OF THE SUB-PROJECT

Please provide information on the type and scale of the sub-project (area, required land, approximate size of total building floor area).

Please provide information about actions needed during the construction/rehabilitation of facilities including support/ancillary structures and activities required to build it, e.g. need to quarry or excavate borrow materials, laying pipes/lines to connect to energy or water source, access road etc.

Please describe how the sub-project will operate including support/activities and resources required to operate it e.g. roads, disposal site, water supply, energy requirement, human resource etc.

PART B: BRIEF DESCRIPTION OF THE ENVIRONMENTAL SITUATION AND IDENTIFICATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

Describe the sub-project location, siting, surroundings (include a map, even a sketch map)

Describe the land formation, topography, vegetation in/adjacent to the project area

Estimate and indicate where vegetation might need to be cleared.

Environmentally sensitive areas or threatened species

Are there any environmentally sensitive areas or threatened species (specify below) that could be adversely affected by the project?

(i) Intact natural forests: Yes _________ No _________

(ii) Riverine forest: Yes _________ No _________

(iii) Surface water courses, natural springs Yes _________ No _________

(iv) Wetlands (lakes, rivers, swamp, seasonally inundated areas)
(v) Yes _________ No _________

(vi) How far is the nearest wetland (lakes, rivers, seasonally inundated areas)?

__________ km.
(vii) Area of high biodiversity: Yes ________ No ________

(viii) Habitats of endangered/threatened, or rare species for which protection is required under Zambian national law/local law and/or international agreements.
Yes ________ No ________

(ix) Others (describe). Yes ________ No ________

Rivers and Lakes Ecology

Is there a possibility that, due to construction and operation of the sub-project, the river and lake ecology will be adversely affected? Attention should be paid to water quality and quantity; the nature, productivity and use of aquatic habitats, and variations of these over time.

Yes ________ No ________

Comments:

Site Hydrogeology (according to available information):

Type of aquifer (continuous, fracture)
Depth of aquifer
Seasonal fluctuations
Known quality problems

Surface Water

What is the water course in the surroundings of the site:

Nature (river, stream, spring, lake)
Distance to site
Downstream/upstream the site

Give an assessment of potential water course sensitivity to water point construction and operation

Drainage conditions on-site

Description of present drainage conditions on site (site topography, infiltration capacity of soil):

Risks of water retention (site in a low point):

Feasibility of simple drainage improvements to eliminate water retention problems:
**Water Use and Water Users**

Describe the water use in the vicinity of the site

Nature of water point

Distance

Downstream/upstream

Type of usage

Give an assessment of potential water use sensitivity to water point construction and operation

Is there potential for conflict between users; if so, how should this conflict be solved?

**Protected areas**

Does the sub-project area (or components of the sub-project) occur within/adjacent to any protected areas designated by government (national park, national reserve, world heritage site etc.)

Yes _______ No __________

If the project is outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected area areas (e.g. interference with the migration routes of mammals or birds).

Yes _______ No __________

**Geology and Soils**

Describe the Site Geology (according to available geological map):

Describe the soil as follows:

Type of soil

Sensitivity to erosion

Extent of erosion already taking place on site

Based upon visual inspection or available literature, are there areas of possible geologic or soil instability (prone to: soil erosion, landslide, subsidence, earthquake etc)?

Yes _______ No __________

Based upon visual inspection or available literature, are there areas that have risks of large scale increase in soil salinity?

Yes _______ No __________
Based upon visual inspection or available literature, are there areas prone to floods, poorly drained, low-lying, or in a depression or block run-off water

Yes __________ No __________

**Contamination and Pollution Hazards**

Is there a possibility that the sub-project will be at risk of contamination and pollution hazards (from latrines, dumpsite, industrial discharges, drilling oils etc)

Yes __________ No __________

**Landscape/aesthetics**

Is there a possibility that the project will adversely affect the aesthetic attractiveness of the local landscape?

Yes __________ No __________

**Historical, archaeological or cultural heritage site**

Based on available sources, consultation with local authorities, local knowledge and/or observations, could the sub-project alter any historical, archaeological, cultural heritage traditional (sacred, ritual area) site, cemetery, graves, or require excavation?

Yes __________ No __________

In the event of a chance find, please contact the Ministry of Culture and the Environment Council of Zambia to seek guidance. Any construction activities should be halted until the chance find has been assessed by the proper authorities.

**Resettlement and/or Land Acquisition**

Will involuntary resettlement, land acquisition, relocation of property, or loss, denial or restriction of access to land and other economic resources be caused by project implementation?

Yes __________ No __________

If “Yes” Involuntary Resettlement OP 4.12 is triggered. Please refer to the Resettlement Policy Framework (RPF) for appropriate mitigation measures to be taken.

**Loss of Crops, Fruit Trees and Household Infrastructure**

Will the project result in the permanent or temporary loss of crops, fruit trees and household infrastructure (such as granaries, outside toilets and kitchens, livestock shed etc)?

Yes __________ No __________
**Block of access and routes or disrupt normal operations in the general area**

Will the project interfere or block access, routes etc (for people, livestock and wildlife) or traffic routing and flows?

Yes _________ No ___________

**Noise and Dust Pollution during Construction and Operations**

Will the operating noise level exceed the allowable noise limits?

Yes _________ No ___________

Will the construction result in emission of significant amounts of dust or hazardous fumes?

Yes _________ No ___________

Will the operation result in emission of significant amounts of dust or hazardous fumes?

Yes _________ No ___________

**Degradation and/or depletion of resources during construction and operation**

Will the operation involve use of considerable amounts of natural resources (construction materials, water spillage, land, energy from biomass etc.) or may lead to their depletion or degradation at points of source?

Yes _________ No ___________

Will the quarries have to be rehabilitated?

Yes __________________ No __________________

**Solid or Liquid Wastes**

Will the project generate solid or liquid wastes? (including human excreta/sewage, sludge, hospital waste, asbestos)

Yes ____________ No ____________

If “Yes”, does the sub-project include a plan for their adequate collection and disposal?

Yes ____________ No. __________________

Are there guidelines for the safe disposal of asbestos?

Yes ____________ No ____________
Public Health

Will the sub-project contribute to an increase in malaria due to an increase in water supply?

Yes: __________ No: __________

Describe the current situation regarding malaria, assess potential impacts due to the sub-project, and recommend an appropriate mitigation measure.

________________________

Occupational health hazards

Will the project require a large number of staff and labourers;

Yes: __________ No: __________

Will the project require a large/long-term construction camp?

Yes: __________ No: __________

Are the project activities prone to hazards, risks and could result in accidents and injuries to workers during construction or operation?

Yes: __________ No: __________

Could project activities result in accidents and injuries to third parties during construction or operation?

Yes: __________ No: __________

Will the sub-project require frequent maintenance and or repair

Yes: __________ No: __________

Public Consultation

Has public consultation and participation been sought?

Yes: __________ No: __________

Document meetings in the Meeting Form and attach to this ESSF.
PART C: MITIGATION MEASURES
For all "Yes" responses above, describe briefly the measures taken to this effect.

<table>
<thead>
<tr>
<th>Identified Impact</th>
<th>Mitigation</th>
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</table>
Sub-Project Categorization (tick applicable box)

**CATEGORY A:** This sub-project has been categorized as A due to one or more major adverse impacts, and therefore cannot be funded under WSPIP. It will be either re-designed and re-submitted to the environmental screening process after re-design, or abandoned.

**CATEGORY B:** This sub-project has been categorized as B due to potential environmental issue identified which can be mitigated as follows:

- **CATEGORY B1:** The application of simple mitigation measures will suffice (using the Environmental and Social Checklist and the ESMP as guides). No separate Environmental Impact Assessment (EIA) will be required;

- **CATEGORY B2:** A separate Environmental Impact Assessment (EIA) will be required to get a better understanding of the potential environmental and social issues that have been identified in the screening process and develop a specific Environmental and Social Management Plan

**CATEGORY C:** No significant environmental issue identified, no specific mitigation required; sub-project implementation can proceed.

Prepared by (name, position, signature):

Date:

Reviewed by (name, position, signature):

Date:

Cleared by (name, position, signature):
ANNEX 2
Public Consultation Meeting Form

Consultation meeting form (page 1 of 2)

Date: 

Sub-Project: 

Location: 

Attendees (full name and position if relevant):

WSPIP Project: 

Other stakeholders: 

Meeting Agenda and Purpose: 

Brief Summary of the Meeting:
Consultation meeting form (page 2 of 2)

Main Issues for Follow-Up:

<table>
<thead>
<tr>
<th>Description of the Issue</th>
<th>Raised by</th>
<th>Proposed follow-up action</th>
<th>To be done by</th>
<th>Comments</th>
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Prepared by:

FINAL REPORT
September 2008
### ANNEX 3: SUMMARY OF THE WORLD BANK'S SAFEGUARD POLICIES

<table>
<thead>
<tr>
<th>Policy Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td><strong>OP/BP 4.01</strong> Environmental Assessment</td>
<td>The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts on its area of influence. OP 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and transboundary and global environment concerns.</td>
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<tr>
<td><strong>OP/BP 4.04</strong> Natural Habitats</td>
<td>This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.</td>
</tr>
<tr>
<td><strong>OP/BP 4.36</strong></td>
<td>The objective of this policy is to assist borrowers to...</td>
</tr>
</tbody>
</table>

*WSPIP has prepared an ESMF to ensure sustainable implementation of its sub-projects.*

*WSPIP will not fund any sub-projects that will negatively affect natural habitats.*
| Forests | Bank-financed investment project (i) has the potential to have impacts on the health and quality of forests or the rights and welfare of people and their level of dependence upon or interaction with forests; or (ii) aims to bring about changes in the management, protection or utilization of natural forests or plantations. 

*WSPIP will not fund any sub-projects that will negatively affect forests.* |
| OP 4.09 Pest Management | The objective of this policy is to (i) promote the use of biological or environmental control and reduce reliance on synthetic chemical pesticides; and (ii) strengthen the capacity of the country’s regulatory framework and institutions to promote and support safe, effective and environmentally sound pest management. More specifically, the policy aims to (a) Ascertain that pest management activities in Bank-financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects. (b) Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user. (c) As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM-based pest management and (ii) regulate and monitor the distribution and use of pesticides. 

*WSPIP will not fund any sub-projects that will require the use of pesticides/herbicides.* |
| OP/BP 4.11 | The objective of this policy is to assist countries to...
<table>
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<tr>
<th><strong>Physical Cultural Resources</strong></th>
<th>avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, “physical cultural resources” are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.</th>
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<tbody>
<tr>
<td><strong>OP/BP 4.10 Indigenous Peoples</strong></td>
<td>The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples; (ii) ensure that adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous peoples receive culturally appropriate and gender and intergenerationally inclusive social and economic benefits.</td>
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<tr>
<td><strong>OP/BP 4.12 Involuntary Resettlement</strong></td>
<td>The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.</td>
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</table>

WSPIP will not fund any sub-projects that will negatively affect physical cultural resources.

WSPIP will not fund any sub-projects that will negatively affect indigenous peoples.

This policy covers not only physical relocation, but any loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets; (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location. This policy also applies to the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.
### OP/BP 4.37 Safety of Dams

The objectives of this policy are as follows: For new dams, to ensure that experienced and competent professionals design and supervise construction; the borrower adopts and implements dam safety measures for the dam and associated works. For existing dams, to ensure that any dam that can influence the performance of the project is identified, a dam safety assessment is carried out, and necessary additional dam safety measures and remedial work are implemented.

This policy is triggered when the Bank finances: (i) a project involving construction of a large dam (15 m or higher) or a high hazard dam; and (ii) a project which is dependent on an existing dam. For small dams, generic dam safety measures designed by qualified engineers are usually adequate.

**WSPIP will neither construct new dams nor rehabilitate existing dams, and none of its investments will depend on a functioning dam.**

### OP 7.50 Projects in International Waters

The objective of this policy is to ensure that Bank-financed projects affecting international waterways would not affect: (i) relations between the Bank and its borrowers and between states (whether members of the Bank or not); and (ii) the efficient utilization and protection of international waterways.

The policy applies to the following types of projects: (a) Hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial and similar projects that involve the use or potential pollution of international waterways; and (b) Detailed design and engineering studies of projects under (a) above, include those carried out by the Bank as executing agency or in any other capacity.

This policy is triggered if (a) any river, canal, lake or similar body of water that forms a boundary between, or any river or body of surface water that flows through two or more states, whether Bank members or not; (b) any tributary or other body of surface water that is a component of any waterway described under (a); and (c) any bay, gulf strait, or channel bounded by two or more states, or if within one state recognized as a necessary channel of communication between the open sea and other states, and any river flowing into such waters.

**WSPIP has triggered the exception provision of this policy and informed the RVP accordingly. No notifications will be**
### OP 7.60 Projects in Disputed Areas

The objective of this policy is to ensure that projects in disputed areas are dealt with at the earliest possible stage: (a) so as not to affect relations between the Bank and its member countries; (b) so as not to affect relations between the borrower and neighboring countries; and (c) so as not to prejudice the position of either the Bank or the countries concerned.

This policy is triggered if the proposed project will be in a “disputed area”. Questions to be answered include: Is the borrower involved in any disputes over an area with any of its neighbors? Is the project situated in a disputed area? Could any component financed or likely to be financed as part of the project be situated in a disputed area?

*WSPIP does not fund any sub-projects in disputed areas.*
ANNEX 4: ENVIRONMENTAL GUIDELINES FOR CONSTRUCTION CONTRACTORS

General: Applicability of These Environmental Guidelines and ESMP
1. These general environmental guidelines apply to any work to be undertaken under the WSPIP Project. For certain work sites entailing specific environmental and/or social issues, a specific Environmental and Social Impact Assessment, including an Environmental and Social Management Plan (ESMP), has been prepared to address the above-mentioned specific issues in addition to these general environmental guidelines. In addition to these general Environmental Guidelines, the Contractor shall therefore comply with any specific ESMP for the works he is responsible for. The Contractor shall be informed by the Client about such an ESMP for certain work sites, and prepare his work strategy and plan to fully take into account relevant provisions of that ESMP. If the Contractor fails to implement the approved ESMP after written instruction by the works supervisor to fulfil his obligation within the requested time, the Client reserves the right to arrange for execution of the missing action by a third party on account of the Contractor.

2. Notwithstanding the Contractor’s obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an ESMP where such an ESMP applies.

3. These Environmental Guidelines, as well as any specific ESMP, apply to the Contractor. They also apply to any sub-contractors present on Project work sites at the request of the Contractor with permission from the Client.

General Environmental Protection Measures
4. In general, environmental protection measures to be taken at any work site shall include but not be limited to:

(a) Minimize the effect of dust on the environment resulting from earth mixing sites, vibrating equipment, construction related traffic on temporary or existing access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity of work sites and access roads.

(b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) comply with Ethiopian standards and are generally kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

(c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels are maintained and/or re-established where they are disrupted due to works being carried out.

(d) Prevent any construction-generated substance, including bitumen, oils, lubricants and waste water used or produced during the execution of works, from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs.

(e) Avoid or minimize the occurrence of standing water in holes, trenches, borrow areas, etc…
(f) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands, local communities and their settlements. Restore/rehabilitate all sites to acceptable standards.

(g) Upon discovery of graves, cemeteries, cultural sites of any kind, including ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works, immediately report such findings to the Client so that the Ministry of Culture and the Environment Council of Zambia may be expeditiously contacted for fulfilment of the measures aimed at protecting such historical or archaeological resources.

(h) Prohibit construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities. Prohibit explicitly the transport of any bush meat in Contractor’s vehicles.

(i) Prohibit the transport of firearms in Project-related vehicles.

(j) Prohibit the transport of third parties in Project-related vehicles.

(k) Implement soil erosion control measures in order to avoid surface run off and prevent siltation, etc.

(l) Ensure that garbage, sanitation and drinking water facilities are provided in construction workers camps.

(m) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.

(n) Ensure public safety, and meet Zambian traffic safety requirements for the operation of work to avoid accidents.

(o) Ensure that any trench, pit, excavation, hole or other hazardous feature is appropriately demarcated and signposted to prevent third-party intrusion and any safety hazard to third parties.

(p) Comply with Zambian speed limits, and for any traffic related with construction at WSPIP Project sites, comply with the following speed limits unless Zambian speed limits are lower:
   - Inhabited areas: 50 km/h
   - Open road: 90 km/h.

(q) Ensure that, where unskilled daily-hired workforce is necessary, such workers are hired from neighbouring communities.

(r) Generally comply with any requirements of Zambian law and regulations.
5. Besides the regular inspection of the sites by the supervisor appointed by the Client for adherence to the Contract conditions and specifications, the Client may appoint an environmental inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State or Regional Environmental Authorities may carry out similar inspection duties. In all cases, as directed by the Client’s supervisor, the Contractor shall comply with directives from such inspectors.

**Drilling**

6. The Contractor will make sure that any drilling fluid, drilling mud, mud additives, and any other chemicals used for drilling at any WSPIP Project construction site complies with Zambian health and safety requirements. In general, only bio-degradable materials will be used. The Contractor may be required to provide the detailed description of the materials he intends to use for review and approval by the Client. Where chemicals are used, general prescriptions of the World Bank’s safeguard policy OP 4.09 “Pest Management” shall be complied with.

7. Drilling fluids will be recycled or disposed of in compliance with Zambian regulations in an authorized disposal site. If drilling fluids cannot be disposed of in a practical manner, and if land is available near the drilling site that is free of any usage rights, the Contractor may be authorized to dispose of drilling fluids near the drilling site. In this occurrence, the Contractor will be required to provide to the Client due evidence of their total absence of potential environmental impacts, such as leachate tests certified by an agreed laboratory. In this case, drilling fluids will be dried at site, mixed with earth and spread at site.

8. Any site affected by drilling work will be restored to its initial condition. This applies to drilling pads, access roads, staging areas, etc… Topsoil will be stripped ahead of any earthmoving, stored near the construction site, and replaced in its original location after the recontouring of the area affected by the works.

9. Where successive aquifers are intersected by the drilling works, and upon order by the work supervisor, the Contractor may be required to take measures to isolate aquifers from contamination by each other.

10. The Contractor will take all measures to avoid bacteriological or chemical contamination of the intersected aquifers by the drilling equipment. Similarly, the Contractor will take all measures to avoid bacteriological or chemical contamination of the intersected aquifers from the surface by providing an adequately sealed well-head.

11. When greasing drilling equipment, the Contractor will avoid any soil contamination. In the event of a limited hydrocarbon spill, the Contractor will recover spilled hydrocarbons and contaminated soils in sealed drums and dispose of them in an authorized waste management facility.

12. Unless duly requested by the Contractor and authorized by the supervisor, no servicing of drilling equipment or vehicles is permitted at the drilling site.
Pipelines

13. No trench shall be left open for more than 7 days, unless duly authorized by the supervisor upon Contractor’s request. Trenches and other excavation works shall be demarcated and/or signposted to avoid third party intrusion.

14. General conditions related with topsoil stripping, storage and restoration apply.

15. The Contractor will take measures to dispose of water used for pressure tests in a manner that does not affect neighbouring settlements.

Waste Management

16. All drums, containers, bags, etc. containing oil/fuel/surfacing materials and other hazardous chemicals shall be stored at construction sites on a sealed and/or bonded area in order to contain potential spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable Zambian government waste management regulations.

17. All drainage and effluent from storage areas, workshops, housing quarters and generally from camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.

18. Used oil from maintenance shall be collected, properly stored in sealed containers, and either disposed of appropriately at designated sites or be recycled.

19. Entry of runoff into construction sites, staging areas, camp sites, shall be restricted by constructing diversion channels or holding structures such as berms, drains, dams, etc. to reduce the potential of soil erosion and water pollution.

20. Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.

21. Where temporary dump sites for clean excavated material are necessary, they shall be located in areas, approved by the Client’s supervisor, where they will not result in supplemental erosion. Any compensation related with the use of such sites shall be settled prior to their use.

22. Areas for temporary storage of hazardous materials such as contaminated liquid and solid materials shall be approved by the supervisor and appropriate local and/or relevant national or local authorities before the commencement of work. Disposal of such waste shall be in existing, approved sites.

Quarries and Borrow Areas

23. The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas or collect river sands. The location of quarries and borrow areas shall be subject to review and approval by relevant local and national authorities.
24. New extraction sites:

a) Shall not be located less than 1 km from settlement areas, archaeological areas, cultural sites - including churches and cemeteries, wetlands or any other valued ecosystem component, or on high or steep ground.

b) Shall not be located in water bodies, or adjacent to them, as well as to springs, wells, well fields.

c) Shall not be located in or near forest reserves, natural habitats or national parks.

d) Shall be designed and operated in the perspective of an easy and effective rehabilitation. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.

e) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing and safety hazards for third parties.

25. Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.

26. Stockpile areas shall be located in areas where trees or other natural obstacles can act as buffers to prevent dust pollution, and generally at a distance from human settlements. Wind shall be taken into consideration when siting stockpile areas. Perimeter drains shall be built around stockpile areas.

27. The Contractor shall deposit any excess material in accordance with the principles of these guidelines, and any applicable ESMP, in areas approved by local authorities and/or the supervisor.

Rehabilitation of Work and Camp Sites

28. Topsoil shall be stripped, removed and stored for subsequent rehabilitation. Soils shall not be stripped when they are wet. Topsoil shall not be stored in large or high heaps. Low mounds of no more than 1 to 2m high are recommended.

29. Generally, rehabilitation of work and camp sites shall follow the following principles:

- To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
- Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- Ensure reshaped land is formed so as to be stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- Minimize erosion by wind and water both during and after the process of reinstatement.
- Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.
Management of Water Needed for Construction Purposes

30. The Contractor shall at all costs avoid conflicting with water needs of local communities. To this effect, any temporary water abstraction for construction needs from either ground or surface water shall be submitted to the following community consultation process:
   - Identification of water uses that may be affected by the planned water abstraction,
   - Consultation with all identified groups of users about the planned water abstraction,
   - In the event that a potential conflict is identified, report to the supervising authority.

This consultation process shall be documented by the Contractor (minutes of meeting) for review and eventual authorization of the water withdrawal by the Client’s supervisor.

31. Abstraction of both surface and underground water shall only be done with the consultation of the local community as mentioned and after obtaining a permit from the relevant authority.

32. Abstraction of water from wetlands is prohibited.

33. Temporary damming of streams and rivers is submitted to approval by the supervisor. It shall be done in such a way as to avoid disrupting water supplies to communities downstream, and to maintain the ecological balance of the river system.

34. No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses. Similarly, wash water from washing out of equipment shall not be discharged into water courses or road drains. Washing bays shall be sited accordingly. Unless site conditions are not favourable, it will generally be infiltrated through soak pits or similar.

35. Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

Traffic Management and Community Safety

36. Location of temporary access roads shall be done in consultation with the local community and based on the screening results, especially in important or sensitive environments. Temporary access roads shall not traverse wetland areas or other ecologically sensitive areas. The construction of any access roads shall be submitted to a prior consultation process with potentially affected communities that will have to be documented (minutes of meetings) for supervisor’s review and approval.

37. Upon the completion of civil works, all temporary access roads shall be ripped and rehabilitated.

38. Measures shall be taken to suppress dust emissions generated by Project traffic.
39. Maximum speed limits for any traffic related with construction at WSSIP Project sites shall be the following, unless Zambian speed limits are locally lower:
   - Inhabited areas: 50 km/h
   - Open road: 90 km/h.

**Salvaging and Disposal of Obsolete Components Found by Rehabilitation Works**

40. Obsolete materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures shall be salvaged and disposed of in a manner approved by the supervisor. The Contractor has to agree with the supervisor which elements are to be surrendered to the Client’s premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.

41. Any asbestos cement material that might be uncovered when performing rehabilitation works will be considered as hazardous material and disposed of in a designated facility.

**Compensation of Damage to Property**

42. Compensation of land acquired permanently for Project purposes will be handled under Client responsibility based on the provisions of the RPF. However, in the event that the Contractor, deliberately or accidentally, damages property, he shall repair the property to the owner’s satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner/user a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

43. In any case where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the supervisor.

**Contractor’s Health, Safety and Environment Management Plan (HSE-MP)**

44. Within 6 weeks of signing the Contract, the Contractor shall prepare an HSE-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an ESMP for the works. The Contractor’s EHS-MP will serve two main purposes:

45. The Contractor’s HSE-MP shall provide at least:
   - a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an ESMP;
   - a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
   - a description of all planned monitoring activities and the reporting thereof; and
   - the internal organizational, management and reporting mechanisms put in place for such.
46. The Contractor's HSE-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's HSE-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

**HSE Reporting**

47. The Contractor shall prepare bi-monthly progress reports to the Client on compliance with these general conditions, the sub-project ESMP if any, and his own HSE-MP. The Contractor's reports will include information on:
- HSE management actions/measures taken, including approvals sought from local or national authorities;
- Problems encountered in relation to HSE aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Non-compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects; and
- Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.

48. The reporting of any significant HSE incidents shall be done as soon as practicable. Such incident reporting shall therefore be done individually. The Contractor should keep his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-monthly reports. Details of HSE performance will be reported to the Client.

**Training of Contractor's Personnel**

49. The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project ESMP, and his own HSE-MP, and are able to fulfil their expected roles and functions. Specific training will be provided to those employees that have particular responsibilities associated with the implementation of the HSE-MP. Training activities will be documented for potential review by the Client.

50. Amongst other issues, training will include an awareness session for all employees on HIV/AIDS addressing the following topics:
- What is HIV/AIDS?
- How is HIV/AIDS contracted?
- HIV/AIDS prevention.
ANNEX 5: DRAFT EIA TERMS OF REFERENCE

1. Provide a full description of the nature of the project with respect to the name of the proponent, the postal and physical address, the spatial location of the potential site for the project, the estimated cost of the project, and size of land for the project site, including water reticulation, waste disposal and access roads.

2. Provide a site-specific map of the area (Scale 1:50,000) showing the proposed project site and existing establishments in the area and surrounding areas. A site plan for the project should also be provided.

3. Examine the existing conditions of the proposed site identifying and analysing:
   - Geological and soil conditions of the area;
   - The scope of vegetative resources of the area;
   - Existing land uses within the area and within adjacent villages;
   - Ecologically important or sensitive habitats and resources e.g. water resources, biodiversity elements; and
   - Suitability of the site for the proposed development.

4. Describe the major activities to be undertaken for the construction and operation of water supply systems. This should include the size and type of water structures, the type of equipment to be used, the method and duration of construction, nature and quantity of wastes to be generated, the facilities for appropriate disposal and management of waste, number of people to be employed and.

5. State the reasons for selecting the proposed site, the consequences of not undertaking the project at the proposed site and any alternative sites considered.

6. Predict the major short and long-term environmental impacts of the project. Examine both the positive and negative impacts as well as impacts on the biophysical, social, economic and cultural components of the environment. The potential impacts must include those related to:
   - project location (e.g. resettlement of people, loss of forest land, loss of agricultural land, impact on flora and fauna);
   - construction works (e.g. soil erosion, disposal of construction spoil, drainage and access roads)
   - project operation (e.g. solid waste disposal, sewage disposal)

7. Prescribe measures to eliminate, reduce or mitigate the negative effects identified and the measures to enhance the positive effects in 6.

8. Propose an Environmental Management Plan (EMP) in tabular form by which all of the mitigation/enhancement measures prescribed will be carried out, specifying who will be responsible for implementing these measures and the schedule for implementation, cost of implementing the measures and the source of funding. An environmental monitoring plan should also be prepared including the indicators to be used for monitoring the impacts and responsible persons and institutions that will conduct the monitoring.
9. Undertake public consultations to ensure that all interested and affected parties are involved in the EIA process and incorporate their views into the EIA. Evidence of consultation should be provided in the report.

10. Provide an account of all statutory and regulatory licenses and approvals obtained for the project to ensure that they are in line with sound environmental management practices and are in compliance with all relevant existing legislation. Reference should be made, but not limited to the Environment Management Act and other relevant and other relevant legislation.

Table 11. ENVIRONMENTAL AND SOCIAL CHECKLIST: Works Items that are likely to require a very limited ESMP (Localised short-term low intensity)

<table>
<thead>
<tr>
<th>Component</th>
<th>Works Programme</th>
<th>Works Item</th>
<th>Expected or Possible Impact(s)</th>
<th>Typical Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Boreholes</td>
<td>Rehabilitation and additional chlorination equipment</td>
<td>Pump and motor refurbishment, flushing and well disinfection</td>
<td>Drilling – noise and dust creation, noise and dust creation, impact on assets</td>
<td>Work during daylight hours only, Prepare Resettlement Action Plan based on RPF</td>
</tr>
<tr>
<td>New Boreholes</td>
<td>Investigation and development of existing aquifers – Chilanga and Chongwe only</td>
<td>Drilling, pumps, control, associated pipe work and chlorination</td>
<td>Drilling – noise and dust creation, generation of drilling sludge, potential to draw-down on nearby boreholes, Impact on assets (e.g. water availability in marginal aquifers)</td>
<td>As above; Ensure safe disposal of drilling sludge as per Zambian regulations</td>
</tr>
<tr>
<td>District Metering</td>
<td>Bulk water meters, data loggers, and telemetry</td>
<td>Installation of bulk meters to record rate of supplies and SCADA/ telemetry for remote supervision</td>
<td>Localised disturbances within existing works areas</td>
<td>Inclusive in pipeline installation works</td>
</tr>
<tr>
<td>Customer Metering</td>
<td>Existing properties/new</td>
<td>Current customers and an estimate of ±48,000 new customers, scattered throughout the four towns</td>
<td>Localised disturbances within peoples’ gardens</td>
<td>Inclusive in pipeline installation works – letter of notification from LWSC</td>
</tr>
<tr>
<td>Treatment Works</td>
<td>Up-rating of the Kafue, Chongwe and Luangwa Water Treatment Works</td>
<td>Replacement of high lift pumping plant (valves, pumps, tank lining, filter-media, fencing)</td>
<td>Localised (i.e. installation of machinery and other equipment within the WTW site) Exposure of workers to harmful</td>
<td>Topsoil, subsoil stockpiling, avoid excavations during the rainy season, Workers to wear protective gear</td>
</tr>
<tr>
<td>Component</td>
<td>Works Programme</td>
<td>Works Item</td>
<td>Expected or Possible Impact(s)</td>
<td>Typical Mitigation</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Service reservoir storage</td>
<td>Rehabilitation of existing reservoirs in all four towns</td>
<td>Reservoir rehabilitation: emptying of reservoirs to repair leaks, tank lining and localised excavations to replace valves (water taps) Desludging of storage tanks and pipeworks</td>
<td>Localised, very minor soils disturbances Exposure of workers to harmful fumes (e.g. lining with glass fibre) Safe disposal of the sludge</td>
<td>Topsoil, subsoil stockpiling, avoid excavations during the rainy season, Workers to wear protective gear Sludge to be disposed of according to chemical properties, if chlorine levels are high sludge should not be used for gardening – consign to an approved landfill site only Very small quantities can be washed out via the tank emptying valve into the adjacent bush without damage to the environment</td>
</tr>
<tr>
<td>Transmission Mains</td>
<td>Strengthening of existing transmission main</td>
<td>Surge equipment, air valves, washouts, thrust blocks, etc. Replacement of old pipes</td>
<td>Localised, soil disturbances</td>
<td>As above ¹</td>
</tr>
</tbody>
</table>
Table 13. ENVIRONMENTAL AND SOCIAL CHECKLIST: Localised Works Items that are likely to require an ESMP (Local to regional medium duration and intensity)

<table>
<thead>
<tr>
<th>Component</th>
<th>Works Programme</th>
<th>Works Item</th>
<th>Expected or Possible Impact(s)</th>
<th>Typical Mitigation</th>
</tr>
</thead>
</table>
| Water Supply Mains renewal & rehabilitation | Strategic transmission mains in Luangwa | Upgrading and replacement of degenerated AC pipes and corroded galvanized iron and steel pipes | 1. Localised excavations, soil disturbances, disruptions to traffic, possible flooding from burst mains
   Danger to pedestrians and traffic where trenches coincide with roads, paths and walkways
   Water supply interruptions
2. Possible damage to other services such as telephone and electricity cables                                                                                                                                         | Topsoil, subsoil stockpiling, avoid excavations during the rainy season
   Access ways required to private properties
   Carefully demarcate trenches in traffic and pedestrian areas
   Only work on short sections of trenching in sloping areas (Luangwa, Chongwe in particular)
   Notify public, in advance of temporary water supply cuts                                                                                                                                                    |
| Water Supply Mains                | Distribution mains refurbishment/ replacement | Mains renewal and rehabilitation, in conjunction with network modelling and leakage investigations – short sections in Kafue, Luangwa, Chongwe and Chilanga (e.g. existing house connections – Kafue, 7300, Chilanga, uncertain, Chongwe, 610 and Luangwa, 212) | 1. As above\(^1\) (where conflicts with properties refer to RFP)
2. Problems on sloping ground due to storm water entrainment in trenches                                                                                                                                 | As above\(^1\), and demarcate trenches
Only work during the dry season                                                                                                                                                                                                                                           |
| Service reservoir storage         | Study on the future rehabilitation of Chongwe dam | Dredging of reservoir, cleaning intakes, small scale structural repairs under WSPIP | 1. Public health impact from workers coming into contact with sewage contaminated silt
2. Displacement of arable land for storage/composting of silt                                                                                                                                                  | Assess silt soil quality, if fit as fertilizer this can be used to enhance maize production on nearby fields. If faecal coliforms are too high, designate a storage area for composting
Potential compensation requirement for temporary land take                                                                                                                                                      |
| New                               | Mains and Total properties to be derived | Extensive, medium to long-term                                                                 | Do main trenching in areas where disruptions                                                                                                                                                                               |                                                                                                                                                                                                 |

\(^1\)As above refers to localised excavations, soil disturbances, possible flooding from burst mains, and possible impact on traffic, pedestrians, etc.
<table>
<thead>
<tr>
<th>Component</th>
<th>Works Programme</th>
<th>Works Item</th>
<th>Expected or Possible Impact(s)</th>
<th>Typical Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Areas</td>
<td>services to priority development areas, provide T's and leads for future house connections</td>
<td>from the proposed investment plans to be finalised in 2008 (e.g. estimated 2,360 and 260 new house connections in Kafue and Chilanga within 2011)</td>
<td>disturbances (several weeks to a few months) Traffic redirection, trenching noises, soil stockpiling in narrow service-ways, dust in dry season, mud in rainy season Danger to pedestrians and traffic Noise, danger to public, damage to infrastructure due to rock blasting Impact on assets Land Acquisition</td>
<td>will be minimal, do very short sections of 'link' trenches where disruptions will occur – especially to traffic – to reduce period of traffic disruption Dry season work, wherever possible Dampen down soil stockpiles Avoid extensive damage to trees by careful pipeline alignment and work in narrow servitude areas Demarcate trenches very clearly Prepare Resettlement Action Plan based on RPF</td>
</tr>
<tr>
<td>Peri-urban extensions</td>
<td>Upgrading of undersize water mains, provide new stand-posts, T's and leads for future connections</td>
<td>As above (e.g. new stand-posts to increase from 15 to 21 in Kafue)</td>
<td>As above</td>
<td>As above</td>
</tr>
<tr>
<td>Sanitation to Peri-urban areas</td>
<td>Programme to improve on-site disposal</td>
<td>Design and construction of on-site sanitation using appropriate technologies including extension of sewer lines (primary, offtake and linking to the existing mains network) and introduction of alternative dry toilet designs (VIPs, etc)</td>
<td>Mixing of sewerage and Council Water Supplies if sewers and water supplies pipes are located in the same servitude Danger to pedestrians and traffic where trenches coincide with roads, paths and walkways Impact on assets Land Acquisition</td>
<td>Topsoil, subsoil stockpiling, avoid excavations during the rainy season Plan works through the EMP to avoid problems, and include emergency mitigation measures to be taken by Contractor where problems do occur Demarcate trenches Prepare Resettlement Action Plan based on RPF</td>
</tr>
</tbody>
</table>

1As above: Refers to the description in the corresponding column in preceding row. 2Please refer to the Resettlement Policy Framework (Appendix 5)
Table 14. ENVIRONMENTAL AND SOCIAL CHECKLIST: Site Specific Works Items that are likely to require a separate EIA and a Comprehensive ESMP (local to regional medium to long-term, high intensity)

<table>
<thead>
<tr>
<th>Component</th>
<th>Works Programme</th>
<th>Works Item</th>
<th>Expected or Possible Impact(s)</th>
<th>Typical Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation of the existing Sewerage Network</td>
<td>Kafue Town only</td>
<td>Upgrading and replacement of degenerated AC pipes and corroded galvanized iron and steel pipes</td>
<td>Large-scale excavations, soil disturbances, disruptions to traffic, excavations on private property, possible flooding from burst mains, odours and localised/general contamination Damage to natural vegetation Danger to pedestrians and traffic where trenches coincide with roads, paths and walkways²</td>
<td>Topsoil, subsoil stockpiling, avoid excavations during the rainy season Assess for land owner and possible need for compensation Use labour intensive methods and/or very small machinery in narrow confines Carefully demarcate trenches in traffic and pedestrian areas Diversion of sewer Topsoil, subsoil stockpiling, avoid excavations during the rainy season Preferable use an approved landfill site for sewerage sludge disposal Possible alternatives for mulching and recycling of dredged material for improving soil condition in nearby agricultural lands Possibility if using reeds and bulrushes for basket weaving and making mats in Kafue. If not, check the acceptability of burning unwanted dry plant matter in adjacent lands areas to deposit ash for improved soil fertility Consultation with Environmental Council of Zambia will be required in connection with the disposal of both the sludge or burning of unwanted plant matter in adjacent land areas. ECZ will recommend the ways of doing it in accordance with the Environmental Protection &amp; Pollution Control Act.</td>
</tr>
<tr>
<td>Rehabilitation of existing maturation ponds</td>
<td>Kafue only</td>
<td>Sludge and aquatic plants to be removed, repair embankments, wave protection, works to banks and installation of flow meters</td>
<td>Localised, soil disturbances, disruption to sewerage off-take Possible extension into adjacent land Disposal of sludge and plant matter</td>
<td>Topsoil, subsoil stockpiling, avoid excavations during the rainy season Preferable use an approved landfill site for sewerage sludge disposal Possible alternatives for mulching and recycling of dredged material for improving soil condition in nearby agricultural lands Possibility if using reeds and bulrushes for basket weaving and making mats in Kafue. If not, check the acceptability of burning unwanted dry plant matter in adjacent lands areas to deposit ash for improved soil fertility Consultation with Environmental Council of Zambia will be required in connection with the disposal of both the sludge or burning of unwanted plant matter in adjacent land areas. ECZ will recommend the ways of doing it in accordance with the Environmental Protection &amp; Pollution Control Act.</td>
</tr>
</tbody>
</table>

¹As above: Refers to the description in the corresponding column in preceding row. ²Please refer to the Resettlement Policy Framework (Appendix 5)
ANNEX 6: ENVIRONMENTAL MANAGEMENT AND TRAINING PLAN

PART 1. BACKGROUND INFORMATION

1.1 Preamble

An Environmental and Social Management Plan (ESMP) contains instructions allowing the investor/proponent to integrate the environmental concerns emerging from the development of the ESMF into the process of project implementation, and to adapt the ESMP to the specific requirements of the sub-project as appropriate. Similarly, the ESMP is also intended to provide a basis on which a Contractor can firstly be advised about the expected environmental and social impacts generated by the works, and then to serve as a guideline so that the Contractor can factor in the costs of the mitigation measures to be taken during the construction works. By including the costs of remedial works and mitigation, the Contractor can ensure fair payment for environmental mitigation works carried out.

Compliance with these instructions is the responsibility of the owner of the project, in this case LWSC. Subsequently, in all of the project’s lifecycle phases, LWSC must delegate responsibilities to other parties intervening in the project, namely the contractor (and subcontractors), so as to guarantee that guidelines and instructions are complied with. LWSC will oversee the implementation of the provisions of the ESMP and ESMF.

The ESMP comprises a range of general and specific recommendations, which collectively act as the basis for environmental management (impact mitigation) and control, during the construction and operation phases of the project. The majority of impacts described above in chapter 6 are of a temporary nature and mostly limited to the construction phase. The remaining impacts can easily be monitored as long as the project makes provision for regular inspection and monitoring. In the course of project implementation, the sub-project implementers will apply the environmental and social screening process to determine the extent of potential adverse environmental and social impacts and to identify and implement appropriate mitigation measures as discussed in Chapter 7.

This document thus serves to identify the principles, responsibilities, activities and (some) methodologies that the contractor shall adopt to effectively manage environmental and social impacts during the construction phase of the project and that LWSC shall adopt during the operation phase. The ESMP is a dynamic document and can be reviewed and updated as necessary throughout the duration of construction by LWSC’s Environment Officer and/or the contractor staff responsible for implementing the ESMP. In this way the ESMP can be considered essential in supporting public confidence that the eventual benefits from the work will far surpass the inconveniences experienced during the works period of the project.

Purpose of the Environmental and Social Management Plan

The purpose of the Environmental and Social Management Plan (ESMP) is to present the institutional arrangements for its implementation as well as provide environmental and social standards for the construction, operation, and routine maintenance of the proposed rehabilitation of water supply and sanitary systems in the 3 district towns of Kafue, Chongwe and Luangwa.

i. The Contractors are legally required to comply with the frame of reference and standards of the project. While this ESMP provides background information, it is the Contractor’s responsibility to verify the accuracy of any information provided and, irrespective of any inaccuracy or incompleteness, to comply with the frame of reference and standards.
ii. The frame of reference for the environmental and social standards is to avoid impairing (a) the health or wellbeing of people, and (b) land capability.

iii. LWSC should monitor compliance with the frame of reference and project standards.

iv. The Contractor should be required to present method statements to LWSC for approval for a number of construction activities. The ultimate responsibility for non-compliance with the standards in this document lies solely with the contractor.

v. LWSC retains the right to enforce compliance with the standards irrespective of non-compliance that it might, at its sole discretion, condone in certain instances.

vi. LWSC's Environment Officer will monitor the implementation of the Environmental Guidelines for Contractors (Chapter 7 – annex 4) as well as the environmental and social screening results (Chapter 7 – Annex 1) and the WSPIP ESMP (table 15).

Scope of work
The scope of work covers material and construction requirements for:

- Clearance of sites and way-leaves for water supply and sewerage pipes, including for the upgrading and extension works
- Excavation of trenches and foundations
- The placing of backfill
- Access track lay-down, turning and parking areas
- The storage and protection of topsoil
- Temporary construction worker camps
- Erosion control and re-vegetation
- Handling and disposal of sewage contaminated silt/sludge

1.2 Introduction to the ESMP

In the course of preparing the ESMF, the consultant was able to identify key issues and mitigation measures designed to alleviate these impacts, and propose the following procedures for undertaking these mitigative steps.

While the principles of the ESMP and Environmental Guidelines for Contractors are to be incorporated into the contractual agreements between LWSC and LWSC's contractors who are appointed to undertake the required work, certain commitments are required from LWSC.

LWSC Commitment
LWSC is committed to ensure that the rehabilitation of the proposed water supply and sanitation systems is undertaken according to the recommendations of this report and that the work is undertaken in such a way that is respectful to the local people and their land and resources. In this regard LWSC emphasised following the presentation of the findings of the ESMF at the Stakeholder's Consultative Workshop in Lusaka on 4th July 2008, the importance of close cooperation with its representative engineers and the Contractor and their respective Environment Staff.

Although the net result of the works will be highly beneficial to the people of Kafue, Chongwe and Luangwa, there should be adequate advanced warning of the project, with information on how the works will be mitigated to minimise the negative impacts on the people who will be affected by the works. To this effect, LWSC and/or the contractor should:

- Advise managers, supervisors and employees of safety, health and environmental requirements, and hold them accountable for performance;
Manage activities to minimise environmental and human health impacts and provide workplaces where recognised hazards are minimised or controlled;

Provide professional staff to support safety, health and environmental protection commitments;

Monitor, evaluate and report performance in safety, health and environmental protection;

Provide training when needed to protect human, environmental, cultural and physical resources;

Failure to report incidents and wilful non-compliance with LWSC policy will result in disciplinary action in accordance with internal disciplinary guidelines.

Environmental and Social commitment and quality management for the project

The contractor should:

- Comply with all of the requirements of the ESMF and ESMP, and RPF (where there is impact on assets or land acquisition) and shall, in accordance with environmental and social screening results as well as accepted standards, employ techniques, practices and methods of construction that will ensure compliance with this standard as well as requirements for environmental and social management and, in general, minimise environmental and social damage, control waste, avoid pollution, prevent loss or damage to natural resources, and minimise effects on surrounding landowners, occupants and the general public.

- Prevent or minimise the occurrence of accidents which may cause damage to the environment, prevent or minimise the effects of such accidents and shall return the environment to a state as close to the condition existing prior to any such accident as possible as per Environmental Guidelines for Contractors.

- Should it be considered by Government Authorities that the construction activities of the contractor are causing unacceptable environmental and/or social damage, the contractor shall immediately consult with the appropriate government authorities and LWSC and agree upon the remedial measures to be undertaken. Such agreed remedial measures shall be undertaken immediately to prevent further damage and to repair any damage that may have occurred. However, WSPIP sub-projects are unlikely to cause unacceptable environmental and/or social damage because all sub-projects will be screened for potential adverse environmental and social impacts and any mitigation measures will be implemented prior to the commencement of civil works (see chapter 7 for details).

- Commence any remedial measures within a reasonable period following the receipt of a written instruction from LWSC to do so.

- Be open to periodic environmental and social compliance audits by LWSC and provide the necessary information for such purposes. In addition the contractor shall implement their own audits to ensure conformance with the requirements of the ESMP and the RPF.

- Prepare and submit plans to LWSC demonstrating the method according to which compliance with the environmental and social standards will be accomplished. While LWSC may comment on any inadequacies in these plans, the ultimate responsibility for non-compliance with the standards in this document lies solely with the contractor.
Arrangements required for Monitoring during the Construction Phase

ESMP Operation
The proponent, LWSC, will appoint an environmental management officer (EMO) while the construction contractor will nominate an environmental site officer (ESO). The ESO will be the Construction Contractor’s (CC) focal point for all environmental and social matters and is routinely on-site for the duration of the construction works. The EMO will be the current Environment Officer working at LWSC.

ESOs are appropriately trained technical officers (often the CC site engineer). The ESO carries out regular inspections of the CC activities in relation to environmental and social issues, and provides day-to-day advice to Contractor personnel about environmental and social issues.

EMO Roles & Responsibilities
The EMO should be responsible for monitoring, reviewing and verifying compliance with the ESMP by the Construction Contractor. The ESO should also ensure compliance (as per the construction contract). The EMO’s duties in this regard, and working with the CE who will have day-to-day interaction through supervisory staff, should include the following:

Checking CC equipment complies with the contract specifications regarding environmental standards;

Issuing or refusing the final Environmental Compliance Certificate (post construction-audit) to the Construction Contractor;

Taking decisions in case of severe non-compliances to the ESMP are detected;

Providing input for ongoing internal review of the ESMP;

Stopping works in case of emergency or if significant environmental or social impacts are apparent or imminent.

The EMO ensures the CC has all plans, procedures, approvals, and documentation in place to ensure ESMP compliance prior to commencement of any work. The EMO’s duties here include the following:

i. Supervising preparation and maintenance of the ESMP;
ii. Ensuring Resettlement Action Plans are prepared, where there are impacts on assets and/or acquisition of land, and implemented prior to construction/ civil works activities
iii. Monitoring and verifying that the ESMP is adhered to at all times and taking action if the specifications are not followed;
iv. Monitoring and verifying that environmental and social impacts are kept to a minimum;
v. Sampling sites and surrounding areas regularly with regard to compliance with the ESMP;
vi. Reporting on the environmental and social issues to ?????;
vii. Recommending the issuing of penalties (via the proponent and CE) for contraventions of the ESMP;
viii. Recommending to stop work in emergencies or if significant environmental or social impacts are apparent or imminent;
ix. Completing post-construction audit;
x. Participating, upon request in meetings with interested or affected parties as requested by the proponent.
ESO Roles & Responsibilities

The ESO(s) has the responsibility of observing construction activities and ensuring that those activities are in compliance with the EMP requirements from the CCs side. To accomplish this, each ESO should be familiar with the EMP and contract specifications.

The specific responsibilities of the ESO are to:

i. Monitor implementation of environmental and social measures by CC construction staff against contractual obligations by:

ii. Detecting non-conformance and approving corrective action (with advice from EMO if necessary); and

iii. Identifying circumstances requiring management decisions to evaluate variance or compliance issues.

iv. Interface with EMO to assist in field interpretation of environmental and social requirements, provide advice regarding corrective actions and resolving non-compliance situations, and issue specific formal instructions to the CC workforce;

v. Interface with CC manager to help communicate requirements, obtain a hands-on view of special problems so that implementation difficulties can be communicated to the EMO to aid in problem resolution especially in situations where adjustment of compliance requirements may be necessary;

vi. Regularly communicate to EMO by monthly reports:

Arrangements required for Monitoring during the Operational Phase

Monitoring during the operational phase of the project is through standard LWSC operational procedures, including environmental monitoring. These have been standardised and are being strengthened through the World Bank Institutional Strengthening Support program for LWSC.

Reporting Relationships – Institutional Linkages

The project site ESOs for the different project areas should report both to the local works Contractor, and through him, to the LWSC Project EMO, who reports back to the LWSC Project Steering Committee.

Institutional Training & Strengthening Requirements for Monitoring

At present there is one Environmental Officer (EMO), but no environmental unit at LWSC. It is recommended that, in addition to the EMO, LWSC appoint several persons to receive environmental training to enable LWSC to ensure long-term continuity with regard to environmental and social inspections, monitoring and adherence both by Contractors and by LWSC.

Arrangements for Post-Construction Works Environmental and Social Audit

Once the works are completed, there should be a full audit of environmental and social impacts to ensure compliance by the Contractor under the signed agreement, where the agreement has included the costs of environmental mitigation.
In order to ensure compliance with the ESMP, it is recommended that the Contractor's bond should not be released until the EMP audit has been completed and signed off by the Environmental Management Officer (EMO) representing the LWSC.

PART 2. CAPACITY BUILDING AND ENVIRONMENTAL TRAINING

At present there is one Environmental Officer (EMO), but no environmental unit at LWSC. It is recommended that, in addition to the EMO, LWSC appoint several persons to receive environmental training to enable LWSC to implement the environmental and social screening process as outlined in this ESMF; this process includes the monitoring of environmental indicators. The provision of relevant environmental training under WSPIP will ensure long-term continuity with regard to environmental and social management at LWSC. As required, additional personnel should receive environmental training, for example, ESOs.

To ensure effective implementation of the ESMF, it is proposed that LWSC's Environment Officer and relevant LWSC staff receive environmental training with an emphasis on the following areas:

- Review of the Zambian environmental policies, laws, regulatory and administrative frameworks,
- Review of the World Bank's safeguard policies,
- Environmental and social screening process (with one practical exercise on a real site),
- ESMP and environmental guidelines applicable to construction contractors,
- Assignment of environmental categories,
- Carrying out of the environmental work as discussed in the ESMF,
- Review and clearance of the screening results and separate EIA reports,
- Public consultations,
- Environmental monitoring and evaluation in the context of WSPIP sub-projects,
- Environmental guidelines applicable to construction contractors,
- Environmental issues in Zambia such as soil erosion, wind erosion etc.
- Waste management issues (safe disposal of sludge, drilling waste, asbestos, waste water disposal, construction waste disposal etc.)
- Malaria measures with support from the Ministry of Health
- Impacts of HIV/AIDS
- Social impacts as per RPF.

A variety training and capacity building will be provided as necessary. This may include workshops, short courses, and study tours. A budget of up to US$ 100,000 has been provided for under Part A of the AF credit.
PART 3. COMPONENTS OF THE ENVIRONMENTAL MANAGEMENT PLAN

3.1 Health, Safety and Environment

Awareness

Environmental and social awareness plays an important role in achieving compliance for environmental management. In this regard the following steps shall be taken to ensure all contractor and sub contractor staff are informed and trained appropriately:

- Environmental and Social Awareness Orientation shall be given to all employees, subcontractors and consultants as part of their general orientation. LWSC to verify the HSE procedure for Training and Induction of the contractor.

- Basic environmental and social auditing and compliance training should be provided to the Safety Officers on site and persons responsible for the day to day monitoring of environmental and social performance.

- The Environmental Site Officer (ESO) should have the necessary training to conduct compliance audits throughout the duration of the project with the help of the EMO.

- The ESO will promote onsite environmental and social awareness through talks / meetings and promotions throughout the extent of the project.

- All environmental and social incidents that occur on site, or adjacent areas, will be reported and addressed through the HSE reporting procedure of the contractor

- A register will be maintained by the ESO that will log all environmental and social complaints raised by landowners, occupiers or the general public in connection with construction activities. This register will be available to LWSC for periodic review.

- The register shall be regularly updated and shall maintain records including the name of the complainant, his or her domicile and contact details, the nature of the complaint and any action that was taken to rectify the problem.

- The Environmental Officer in conjunction with the HSE manager will be responsible for drafting the environmental and social complaints report, handling complaints and maintaining the register.

Health and safety of local populations

The excavation of trenches and subsequent construction works to replace pipes and/or to repair existing structures (e.g. storage reservoirs, buildings etc.), dredging and storage of potential sewage contaminated sediment will in places take place near existing dwellings and public places.

Lack of care or lack of information can cause accidents (e.g. traffic incidences, electrocution and people falling into trenches where they may suffer injury/ risk of disease from contact with effluents). Thus, people living in the area under direct influence of construction works, should be informed by LWSC or their appointed representative regarding appropriate security precautions, for example:

- Not allowing children to play near construction sites (e.g. such as climbing into trenches, excavation sites, storage depots etc)
- Warn children not to play with kites and slingshots near overhead lines.
- Avoid handling left-over construction material (e.g. broken pipes, cables etc)
- Education relating to the risk of disease from sewage
- HIV/AIDS awareness for construction crews and general public affected by a potential migrant work force to be provided in consultation with Zambia's HIV/AIDS Program.

3.2 Mitigation measures

Preliminary Ground Survey

The Contractor should undertake an initial site survey to assess the alignment and/or location of the works. The site survey should also be used to take note of any property that may be damaged during the works phase of the project. The Contractor will implement the Environmental Guidelines for Contractors (chapter 7 – annex 4) which will be adapted to the particular requirements of WSPIP sub-projects.

Where the Contractor is aware that damage may occur to property, he should notify the property owner, and advise the owner about the works program. The Contractor must then ensure a RAP is prepared and implemented, based on the RPF, which will include the method used to reinstate the damage.

Damage may be incurred to garden walls, buildings (temporary, or permanent) to trees and woodlands. Wherever possible, the Contractor should attempt to route pipeline trenches and vehicle access to works areas, so as to minimise damage to people, property and natural (or planted) vegetation. This also applies to other services such as water supplies, telephones and power supplies.

The Contractor should also note drainage lines, storm water drainage channels etc, to ensure that these are not blocked when seasonal thunder storms occur.

The Contractor should also obtain up-to-date information on the locations of services and supplies located within the works area (power, telephones, water, sewerage) that are not relevant to the works program, and ensure that these are not damaged or disrupted. Where this cannot be avoided, the relevant authorities should be notified, so they can, in turn, notify their customers.

Support measures for mitigation works

The Contractor may require assistance for the mitigation works, particularly in identifying methods to reinstate soils and prevent erosion, and also in dealing with the general public in areas where works operations create inconveniences for local residents and traffic. Community preferred/recommended ways of undertaking the construction and inherent mitigations should therefore be examined through early consultation. For example:

- Vegetation clearing along trench-lines could be done initially by hand, then root grubbing and topsoil either manually or mechanically, placing topsoil in a spoil-heap/windrow outside of the excavation line. The final trenching pipe-laying and backfilling should be carefully compacted back to original soil density before the topsoil is placed back over the re-compacted trench line.

- In areas where soil erosion is likely to result from trenching and other surface works (e.g. on steep slopes, or in sodic soils such as found in Luangwa), soil stability can be enhanced either through the use of contour bunding and planting grass (Vetiver grass is commonly used in the region for this) or in severe cases gabion baskets and rock-fill can be used to stabilise drainage line erosion.

- There some local cottage industries in the project areas who grow indigenous trees and shrubs for sale on the road side. These people can be contracted to replace cleared
vegetation and ensure success in a revegetation program in locations where this may help to stabilise the soils.

This will also be an appropriate opportunity to notify the affected communities of the proposed works, including the measures that will be taken to ensure that negative impacts are mitigated to the greatest possible extent.

**Site Management**

Within/on each works site, there should be a works manager to supervise the operations as well as an Environmental Site Officer (ESO) to monitor compliance with the ESMP. These persons should be hired by the Contractor, and the work should also be checked on a regular basis by designated counterpart staff within LWSC (e.g. EMO and others, to ensure that all aspects of environmental health and safety are adhered to and that social issues are properly addressed. The site manager should ensure that heavy vehicles entering and leaving the works area are assisted at all times by a person/persons responsible for ensuring the safety of pedestrians and vehicular traffic moving past the entry and exit points to each site.

There should always be enough people on site to assist in moving heavy equipment, where this is to be done manually.

A daily schedule of work progress and adherence to the EMP should be logged with the ESO. This log should contain a brief summary of the day’s events, and should record any site accidents and other problems that need to be addressed by the Engineer on behalf of the Client.

**Timing of works**

Disruption to traffic and pedestrian access – mainly detours and hold-ups where trenches cross major routes and residential area access (e.g. mainly Kafue as road traffic within the remaining towns is very limited)

To avoid unnecessary hold-up, limit delays and general nuisance, the movement of heavy construction related traffic to and from site should be monitored and assisted by traffic controllers.

Warning signs should be displayed informing by-passers of imminent danger regards ongoing works.

Storm-water entrainment in trenches on steep slopes (e.g. Chongwe and Luangwa) and ponding on level ground (e.g. Kafue)

Disruption to other services in narrow servitudes, e.g. power supplies, telephone lines, storm-water drains blocked by soil stockpiles, etc. (e.g. all)

Soil and landscape rehabilitation works to be completed as rapidly as possible after works are completed

Any works that will require open trenching works should not take place during the rainy season. The Contractor must ensure that trenching works are scheduled for the dry season. If it is not possible to work on trench sections during the dry season, e.g. under emergency works, trenches should have a protection beam around them, to prevent them from filling up due to storm water runoff into them, and they should also be pumped out regularly, to ensure that there is no standing water left in the trenches.
One of the major public and environmental concerns is when trenches are left open for long periods, as they are dangerous, when left open. They also become accident traps and repositories for rubbish disposal.

**Excavation works and land preparation**

Where the Contractor is required to undertake ground excavations for trenching and other disturbances such as clearing and grubbing, a set procedure should be followed, in order to make environmental rehabilitation easier, once the works have been completed.

Firstly, a works area should be established, according to the amount of soil to be excavated, and the types of materials (sand rock, clay, vegetation) to be moved. Space should also be left to ensure access for vehicles bringing in materials (pipes, valves etc) and heavy equipment for installing the materials. Space should also be left to ensure safe access by pedestrians and vehicular traffic, unless the site is to be closed off for the period of the works (this is possible mainly in the LWSC enclosed sites targeted for rehabilitation, e.g. sewer pump stations, boreholes, water tanks and reservoirs, and sewerage works areas).

For clearing and grubbing, only very little surface soil should be cleared (to 50mm depth or less, wherever possible), along with any vegetation that is to be removed for access to a works area. The grubbed material should be placed in either spoil heap, or spoil line on one side, but furthest from the excavation, within the prescribed works area.

Topsoil excavations are then placed in a separate spoil heap, or line adjacent to, but closer than the grubbed materials. Finally, the subsoil excavations should be placed closest to the excavations, also in a spoil heap, or line, depending upon the extent of the works.

It may be necessary to water down the spoil heaps from time to time, to reduce the amount of dust blowing around the works area and onto adjacent areas, particularly in densely populated areas.

Any blasting should be conducted according to the Blasting Regulations and only after acquiring appropriate blasting permits.

All open trenches should be clearly demarcated, and where they have to be open for extended periods, they may require fencing to prevent people from entering the works site.

Where open trenches block access to businesses access should be ensured by the Contractor, by providing adequate and safe crossing points for vehicles and people to gain access to the business locations. Failure to comply will trigger compensation proceedings, and where the Contractor has been found negligent, costs may be extracted from the contractors bond.

**Raw Materials to be used**

The raw materials to be used for the rehabilitation works will include small amounts of river sand for bedding pipelines and concrete works. The major part of the works will involve the replacement of pipes, old machinery, electrical and mechanical parts and communications equipment used to monitor the performance of the water and sewerage systems managed by the LWSC.

**Waste Management**

All construction waste must be cleared away regularly, and disposed of in a designated landfill site.
Potential sewage contaminated sediment/sludge resulting from the dredging of the maturation ponds in Kafue and reservoir in Chongwe should be tested, and depending on quality either used as fertilizer to boost agricultural production on nearby fields, composted in a designated area or as a last resort, taken to a landfill. Testing can be done for water quality by LWSC, while soils testing can be done at the University Laboratories in Lusaka.

All materials such as broken machinery and non-functional LWSC works parts may either be sold as scrap, or consigned to an approved landfill site.

Where the Contractor removes mineral oils and other chemicals during the servicing of LWSC machinery, or the Contractor's own machinery, these should be stored in sealable containers, and either removed by a designated sub-contractor for recycling, or disposed of in an approved landfill site that is designated for hazardous waste.

**Sewerage Management**

Inadequate storage for sewerage treatment during and/or immediately after high rainfall storms is likely to result in the following impacts:

- Contamination of surrounding drainage lines and major rivers
- Potential contamination of ground water supplies
- Spread of diseases
- Hazards associated with working in these places

The Contractor must ensure that raw sewerage does not run outside of the trenches where old sewer pipelines are being replaced. It is also critical to ensure that sewer trenches under rehabilitation do not fill with rainwater/storm water runoff or that people and animals can fall into open holes. Trenches must thus be clearly marked and fenced in.

To ensure that sewerage is properly disposed of, a septic tanker will need to be available during the pipe excavation and removal. The septic tanker must have the necessary equipment to pump sewerage into the tank from pipeline trenches. Sewerage collected should then be disposed of at the nearest operational sewerage treatment works site.

In addition the emptying and rehabilitation of sewage ponds to increase storage volume and prevent leaching will require temporary on-site storage and or treatment. Depending on the volumes and nature of the sludge (i.e. liquid/solid and composting stage) there are several methods that may be used. Relevant examples include release/treatment of the supernatant wastewater with the solid fraction being dried, incinerated or spread onto appropriate lands (i.e. non-cultivated). The choice of methods should be based on international best practice as described in the EPA guidelines on disposal and treatment of sludge.

All works staff should be provided with appropriate safety equipment when working with raw sewerage (i.e. gloves, masks, rubber boots and protective overalls). They should also be checked to ensure that they are using the equipment when working with raw sewerage.

**Air Quality and Environmental Health**

Odours released where sewer lines and the maturation ponds are excavated (e.g. Kafue) including dredging of the Chongwe dam and reservoir, plus potential hazard of raw sewerage being released – soil contamination and spread of diseases e.g. cholera, dysentery, typhoid

Air quality problems can occur where trench excavations are taking place and where sewerage ponds are emptied for rehabilitation works.
Odours should be kept to a minimum, by ensuring that any open, or exposed sewers are closed off at night, after work has stopped on the site.

Any accidental, or intentional releases of sewerage should be pumped into a sewerage tanker and disposed of at the nearest operating Sewerage Treatment Works Site.

**Noise and Air Quality Management**

Noise, damage to property, danger to traffic due to rock blasting and dust created during excavation

Trenching excavation works will create dust (and noise), and these can be mitigated by watering down trench spoil to prevent dust blowing around, and reducing noise by working during daylight hours only.

**Post-Works Rehabilitation**

Landscape rehabilitation works to be completed as rapidly as possible

The post-works rehabilitation comprises reinstatement of soils in trenches, pipelines and the disturbed areas surrounding all works undertaken by the Contractor.

Trench soils should be replaced and compacted to the same compaction level as surrounding soils, in reverse order to which they have been removed. It is also important to ensure that soils will not erode rapidly following heavy thunder storms that regularly occur around Lusaka. For this reason, it may be suitable (but assessed on a site-by-site basis) to replace grubbed vegetative material, or to plant vegetation over the completed trench-works.

In public areas, the trench soils should be compacted and original, or replacement materials reinstated as soon as possible after the works have been tested and commissioned.

When the works have been completed at a site, the site should be fully rehabilitated as rapidly as possible. The timetable of this rehabilitation will have to be agreed upon between the Contractor and the Engineer’s Representative, and will depend upon the period following which the works are tested. Once the installation/rehabilitation works have been completed, the Contractor should conduct environmental rehabilitation of the site within a period of two (2) weeks.

**Compensation and/or Relocation Issues**

These may be triggered by the following instances:

- Additional land requirements where existing facilities cannot contain the extension works
- Compensation for temporary acquisition of land during the works period
- Impact on assets, such as moving walls, fences or crops, in order to access area for works.

Under the current scope of works as supplied by the LWSC, there should be no need for relocation or compulsory acquisition of land.

In cases where compensation may be required, such as loss of assets or impact on livelihood, procedures must be followed as set out in the Resettlement Policy Framework. People will be informed by LWSC, or their representative engineer, in informing people of the works procedure, the compensation process, and beginning the consultation process. All compensation claims will be addressed through the RPF process which provides guidance on preparing a RAP once location and impacts are known. Where property owners are still aggrieved, they should follow grievance measures set out in the RPF, or the set legal procedures of Zambia (see App. E).
Where additional land is required, for example when installing new boreholes, or land required for extension of their service provision must first prepare and implement a RAP based on guidance and standards set forth in RPF.

Arrangements for Post-Construction Works Environmental and Social Audit

Once the works are completed, there should be a full audit of environmental and social impacts to ensure compliance by the Contractor under the signed agreement, where the agreement has included the costs of environmental mitigation.

In order to ensure compliance with the EMP and social concerns, it is recommended that the Contractor’s bond should not be released until the EMP and social audit has been completed and signed off by the Environmental Management Officer (EMO) representing the LWSC.

Estimated Costs of Mitigation Works

It is very difficult to estimate costs for the mitigation works, and this should be left to the Contractor to quote for, on a site by site basis.

The ESMP and social compliance standards (ie RPF) should be included in the Terms of Reference for Contractors, so that they can assess each works site and bid not only for the costs of the installations and rehabilitation works, but also for the rehabilitation and mitigation works, as a separate item. This process also enables the Engineer to assess the rehabilitation according to the Contractor’s works program and each item can be audited accordingly. The contractor can then receive full payment for the works when each site has been fully rehabilitated / reinstated under the EMP and RPF requirements.

3.4 Summary of Activities

An overview of project monitoring activities, their impacts and proposed mitigation measures including responsible entities is presented in the table below. In designating institutional responsibilities the following abbreviations have been used:

- ESO: Environmental Site Officer (appointed by the Contractor)
- EMO: Environmental Management Officer (appointed by the Client, LWSC)
- ECZ: Environmental Council of Zambia
- LWSC: Lusaka Water and Sewerage Company
- LCC: Lusaka City Council
- KDC: Kafue District Council
- CDC: Chongwe District Council
- LDC: Luangwa District Council

Emphasis is initially placed on the entity dictating policy and operational procedures. However, the proponent (LWSC) will in all cases need to take charge during the implementation (liaising with the relevant entity in the areas outside its own institutional realm).

Costs have been estimated as no additional if the activity is a natural part of the works (i.e proper storage and disposal of materials and equipment, demarcation/management of construction sites and access routes) and otherwise as a percentage of the relevant works item (erosion control, special construction methods etc). Costs that are not directly related to the construction works will need to be costed separately for the relevant impacts. These costs concern compensation and
possibly resettlement where the proposed extension works will encroach on existing settlements/property boundaries as well as various capacity building, awareness creation and communication initiatives required for cooperation and sustainability of the operation (WSPIP).
Table 15. ENVIRONMENTAL AND SOCIAL MANAGEMENT (ESMP) Summary

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<tbody>
<tr>
<td>1</td>
<td>Soil</td>
<td>Construction</td>
<td>Prevent accessibility, increased erosion potential in exposed areas, aesthetics, habitat for insects/ disease vectors</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Stockpiling in designated areas, demarcation of sites, covering to prevent water accumulation Application of Environmental Guidelines for Contractors</td>
<td>No additional</td>
<td>LWSC (urban aesthetics, access etc) ECZ (natural resources, soil integrity, HSE approvals)</td>
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<tr>
<td></td>
<td>(management of excavated and exposed sites)</td>
<td>Operation</td>
<td>None anticipated</td>
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<tr>
<td>2</td>
<td>Sludge and associated aquatic plant matter</td>
<td>Construction</td>
<td>Prevent accessibility, until pathogen content has been determined as low enough to be safe to humans and animals Erosion potential in exposed areas, aesthetics, habitat for insects/ disease vectors</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Test sludge and associated plant matter for pathogen contents Stockpiling in designated areas, demarcation of sites, exposure to sunlight to dry and then ploughing into the existing soils Provide access by local community members to remove useful plant materials (reeds, bulrushes)</td>
<td>No additional</td>
<td>LWSC (urban aesthetics, access etc) ECZ (natural resources, soil integrity, HSE approvals)</td>
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<td></td>
<td></td>
<td>Operation</td>
<td>None anticipated</td>
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<td>3</td>
<td>Water Resources Supply (water supply delivery and abstraction rights for ground and surface water)</td>
<td>Construction</td>
<td>Lack of water supply to consumers, periodic over-abstraction during low flow season leading to user conflicts</td>
<td>EMO</td>
<td>Water tanker used for surplus emergency supply, increase groundwater pumping if river flows become too low</td>
<td>No additional</td>
<td>LWSC</td>
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<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>None anticipated</td>
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<tr>
<td>4</td>
<td>Water Quality</td>
<td>Construction</td>
<td>Discharge of waste water and contamination of water supply and groundwater</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Sewerage to precede water supply where both are to be replaced, immediate removal of any spills (availability of septic tanker at short notice)</td>
<td>No additional</td>
<td>LWSC</td>
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<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>None anticipated</td>
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<tr>
<td>5</td>
<td>Biota</td>
<td>Construction</td>
<td>Loss of vegetation and increased erosion potential, refuge for animals in construction pits, open trenches and materials stockpiles</td>
<td>ESO (site specific) EMO (overall)</td>
<td>Diversion of pipes around vegetation of particular value, selective cutting, removal and proper disposal of all cuttings, monitoring of materials stockpiles</td>
<td>No additional</td>
<td>LWSC (urban aesthetics, accessibility) ECZ (natural resources, soil and ecosystem integrity)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>None anticipated</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>Local Livelihood Issues/ Development Economics</td>
<td>Construction</td>
<td>Reduced/ loss of business potential for street vendors/ markets in construction corridor/ sites, increased employment opportunities</td>
<td>ESO (site specific) EMO (overall)</td>
<td>Designate alternative market areas and facilitate access to infrastructure that temporarily is lost (i.e. public toilets, water taps etc)</td>
<td>5% of site specific works item</td>
<td>LCC, KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>Increased business potential with improved infrastructure</td>
<td>Local Town Council</td>
<td>Designate market areas to avoid future land-use conflicts</td>
<td>Costed separately</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>7</td>
<td>Land Use and Tenure</td>
<td>Construction</td>
<td>Removal of houses/ businesses, reconstruction and resettlement along extensions (peri-urban mainly) Construction of boreholes and water pipelines in arable fields</td>
<td>Local Town Council</td>
<td>Early notification, designate alternative land and issue compensation as specified in Resettlement Policy Framework</td>
<td>Limited, (costed separately)</td>
<td>LCC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>Continued informal settlement along servitude/ extensions</td>
<td>Local Town Council / LWSC</td>
<td>Formalizing of settlements, community development, Separate actions undertaken as per local Government mandate on illegal settlement within amenities servitudes.</td>
<td>Costed separately</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>8</td>
<td>Accessibility</td>
<td>Construction</td>
<td>Obstructions to traffic, increased potential for accidents</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Demarcation of works/obstacles and detours, traffic control, removal of surplus soils, covering of holes Application of Environmental</td>
<td>No additional</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
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<tr>
<td>9</td>
<td>Attractions and Displacement</td>
<td>Operation</td>
<td>Likely improvement where existing uncovered pits and trenches are filled and covered</td>
<td>EMO</td>
<td>No mitigation necessary</td>
<td>No additional</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>Reduced/ loss of access along servitude/ extensions</td>
<td>Local Town Council</td>
<td>(see pt. 7 Land Use and Tenure)</td>
<td>Limited, (costed separately)</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>10</td>
<td>Community Cohesion Surveys</td>
<td>Operation</td>
<td>(e.g. Land Use and Tenure)</td>
<td>Local Town Council</td>
<td>(see pt. 7 Land Use and Tenure)</td>
<td>Limited, (costed separately)</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>11</td>
<td>Health Reports and Statistics</td>
<td>Construction</td>
<td>Noise and disturbance and increased risk of traffic accidents along access routes</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Demarcation of routes, enforcing traffic regulations</td>
<td>No additional</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>None anticipated</td>
<td></td>
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<tr>
<td>12</td>
<td>Safety</td>
<td>Construction</td>
<td>Construction related accidents (on site, traffic, interaction w/materials and equipment)</td>
<td>ESO/ Contractor EMO (overall)</td>
<td>HSE (Health, Safety and Environment guidelines for construction and operations aspects, medical screening and follow-up (Environmental Guidelines for Contractors)</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td>Possible disease outbreaks</td>
<td>EMO</td>
<td>Source protection zones, water quality monitoring</td>
<td>Costed separately</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>13</td>
<td>Vandalism and Theft</td>
<td>Construction</td>
<td>Damage/ loss of construction materials</td>
<td>ESO/ Contractor</td>
<td>Guarding of depots, community awareness</td>
<td>No additional</td>
<td>Contractor</td>
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<tr>
<td>14</td>
<td>Aesthetics</td>
<td>Construction</td>
<td>Spill/ dumping, lack of removal and disposal of leftover materials (sand, soil), littering (wind-blown waste)</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Community awareness, penalties</td>
<td>No additional</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>15</td>
<td>Historical, Archaeological</td>
<td>Construction</td>
<td>Conflicts along existing servitude unlikely, potential conflicts in peri-urban areas (e.g. grave-yards, churches)</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Early notification, community awareness of rights (resettlement compensation policy, see pt. 5 Land Use and Tenure), Seek guidance from Ministry of Culture and Environmental Council of Zambia</td>
<td>Limited, (costed separately)</td>
<td>LCC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>16</td>
<td>Air Quality</td>
<td>Construction</td>
<td>Spreading of dust, reduced visibility at construction sites, potential noxious smells w/ sewerage replacement</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Watering of access routes to reduce dust, avoid/ limit access routes through areas with existing heavy traffic/markets/population centres</td>
<td>No additional</td>
<td>ECZ (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>17</td>
<td>Noise Pollution</td>
<td>Construction</td>
<td>Construction/ blasting noise</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Work during day only, best practice (e.g. established guidelines for blasting)</td>
<td>No additional</td>
<td>ECZ (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>18</td>
<td>Road Maintenance</td>
<td>Construction</td>
<td>Increased wear and tear on existing roads, reduced access</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Traffic control, adherence to speed limits and recommended loads for construction vehicles</td>
<td>No additional</td>
<td>ECZ (overall framework) LWSC (implementation)</td>
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<tr>
<td>19</td>
<td>Environmental Protection Measures</td>
<td>Construction</td>
<td>Ensure sludge from Kafue STW ponds does not flow freely into the Kafue River (distance &gt;250m)</td>
<td>ECZ/ EMO</td>
<td>Community awareness, communication – only do desludging in the dry season so the dry ground absorbs moisture from the sludge, and/or ensure sludge is placed next to the ponds so that water settling out of the sludge flows back into the ponds.</td>
<td>No additional</td>
<td>ECZ (overall framework) LWSC (implementation)</td>
</tr>
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<td></td>
<td></td>
<td>Operation</td>
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<tr>
<td>20</td>
<td>Contractor / Consultant Training</td>
<td>Construction</td>
<td>Improve mitigation/ enhancement and compliance monitoring</td>
<td>EMO/ Consultant</td>
<td>Prepare and conduct training program (no. of materials prepared, no. of participants)</td>
<td>5% of relevant works item</td>
<td>LWSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>Mitigation / Enhancement</td>
<td>Construction</td>
<td>Avoid negative impacts (e.g. pollution degradation of resource base, improve development potential)</td>
<td>EMO</td>
<td>To be facilitated and emphasised as part of training and compliance monitoring/ post construction audit (no. planned / done, contracts record)</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
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</tr>
<tr>
<td>22</td>
<td>Development Projects</td>
<td>Construction</td>
<td>Accessibility to sites, availability of personnel</td>
<td>Local Town Council / EMO</td>
<td>Advisory group feedback, ratio of tasks</td>
<td>No additional</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
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<tr>
<td>23</td>
<td>Environmental Management</td>
<td>Construction</td>
<td>Inefficiencies in implementation, confusion of tasks and responsibilities, and risk of delays and exceeding of costs</td>
<td>ESO/ Contractor EMO (overall)</td>
<td>Evaluations, careful planning of /, effectiveness ratings</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>24</td>
<td>Contractor Requirements</td>
<td>Construction</td>
<td>Risk of unnecessary costs with lack of specificity and</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Proper construction supervision, compliance monitoring</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
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<tr>
<td>25</td>
<td>Local Employment and Supplies</td>
<td>Construction</td>
<td>Risk of increased number of sex workers and spreading of STDs with temporary/ migrant labour</td>
<td>ESO/ Contractor EMO</td>
<td>Community awareness, promotion of condoms, health screening</td>
<td>None anticipated</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>26</td>
<td>Borrow Pit Rehabilitation / Protection / Mining of river sand</td>
<td>Construction</td>
<td>Erosion and risk of accidents with open pits and exposed soil (see also pt. 1 soils)</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Demarcation of sites, work during the dry season Seek alternative sources for sand for construction purposes</td>
<td>None anticipated</td>
<td>KDC, LDC, CDC / ECZ (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>27</td>
<td>Landscape Re-vegetation</td>
<td>Construction</td>
<td>Loss of cover/ shade and soil support, increased erosion risk</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Selective cutting and rapid re-planting / slope stabilization where applicable</td>
<td>5% of relevant works item</td>
<td>ECZ (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>28</td>
<td>Wastes Management Reports</td>
<td>Construction</td>
<td>Pollution risk with unaccounted for waste/ improper disposal</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Establish and conduct training program (No. facilities, No. trainees, Pollution Records, Disposal)</td>
<td>None anticipated</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>29</td>
<td>Resource Protection</td>
<td>Construction</td>
<td>Risk of loss/ degradation of land/ soils, vegetation with uncoordinated implementation of proposed works</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Designate/ prioritize conservation sites, formalize land use</td>
<td>None anticipated</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
</tr>
<tr>
<td>30</td>
<td>Archaeological Protection</td>
<td>Construction</td>
<td>Potential conflicts along extensions (mainly peri-urban areas), lack of awareness of conservation worthy sites</td>
<td>ESO (site)/ EMO / Specialist (overall)</td>
<td>Prepare and conduct training program (No. training Sessions, No. Artefacts, Frequency, Activities of archaeologist</td>
<td>Limited, (costed separately)</td>
<td>KDC, LDC, CDC (overall framework) LWSC (implementation)</td>
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</tr>
<tr>
<td>31</td>
<td>Consultations with Local Officials</td>
<td>Operation</td>
<td>None anticipated</td>
<td>EMO/ LWSC spokes person</td>
<td>Record keeping, awareness creation (e.g. no. types, contacts / decisions made records)</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>None anticipated</td>
<td>Lack of information/communication, negative perceptions of impacts/benefits</td>
<td>EMO/ LWSC spokes person</td>
<td>Establish contracts, awareness creation communication (record, evaluation scale)</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
<tr>
<td>32</td>
<td>Co-operation on Environmental Program</td>
<td>Operation</td>
<td>Increased risk of pollution and accidents without co-operation</td>
<td>ESO, Contractor EMO, LWSC</td>
<td>Establish contracts, awareness creation communication (record, evaluation scale)</td>
<td>No additional</td>
<td>LWSC</td>
</tr>
</tbody>
</table>
3.3 Environmental and Social Monitoring

Environmental Management

It is important that the environmental works should be supervised and monitored at all times, in order to ensure that the greatest possible benefits are gained from the Environmental and Social Management process. General guidelines are provided below, as to how the ESMP can be managed and monitored.

As outlined in the previous section on monitoring arrangements, the Consultant recommends that a person responsible for Environmental Management at all works sites, should be seconded to the works program.

This person should have adequate experience in environmental management, and in dealing with construction works. This person would also have knowledge in monitoring social issues, both on site and with adjacent areas, associated with construction projects. To take advantage of the opportunity to build capacity the position should be allocated to a suitable candidate within LWSC. Alternatively the person could be sourced externally such as from the World Bank’s project assistance program. The drawback then being that the developed capacity may not remain with LWSC following completion of the project.

Site Inspection and Audits

The contractor must develop appropriate protocols for regular site inspections and audits that monitor compliance with environmental and social legislation and best practice, which includes World Bank safeguards standards. LWSC personnel should participate in this process in the context of capacity building for environmental management.

Method Statements and Procedures

Following preliminary ground survey (e.g. see below) and review of the screening checklist the contractor should develop detailed plans and method statements for the elements of construction for which such information is required by the ESMF and ESMP. These procedures and method statements should take into account the findings of the ESMF, the environmental and social screening results and standards required and recommended procedures, and should include:

- Location and construction of material storage depots
- Location and construction of temporary construction worker camps
- Site management, preparing and reinstating working areas
- Excavation and disposal of waste arising from the clearance, excavations and the works generally including dredging
- Methods to deal with any potentially contaminated ground, water, or ground water (e.g. sediment containing sewage)
- Methods to dispose of water in trenches and excavations
- Dust control method
- Noise control method
- Methods for ensuring worker safety
- Methods for ensuring safety of people utilizing adjacent areas

Environmental Monitoring Indicators

The Environmental Monitoring Indicators are derived from Table 15 above. (Environmental and Social Management Summary).
The items that should be monitored and given indicator values include public health and safety, landscape degradation (vegetation, soils, wildlife habitats and waterways), and these indicators will either be subjective (e.g. too much dust, dust is suppressed by watering along dirt roads and soil excavation areas), or they can be measured – particularly soil and water faecal coliform levels.

Many of the items can then be cross-checked against a list of likely impacts, as listed in Table 15 for the Project Construction/Works Phase. For items with potentially significant impacts, the items should be related back to the standard reporting forms for RPF-type issues such as damage to property, while human safety issues should be ticked off following daily inspections of the works areas by the ESO.

The inclusion of the indicators in the WSPIP M&E system should be through submission of daily Incident Report Forms and against an Action Completion Form for works items that have been approved by the EMO and the RE, so that the Contractor can get paid.

The use of the monitoring indicators will be pointless if no follow-up actions are taken. Therefore the responsibility for follow-up of the daily monitoring will be for the ESO to deliver and go through the daily environmental monitoring reports with the RE and the Contractor, and the Contractor should then take immediate action.

The checklist for Environmental Monitoring Indicators is proposed in Table 16 below.

The outcome from putting the indicators into the table is that very few works items (in this project works program) have readily measurable indicators with regard monitoring the environmental mitigation actions. The exceptions to these are levels of faecal coliforms in surface drainage water, and possibly measurements of the numbers of accidents and other incidents that the Contractor has been advised to avoid through mitigation during the works program (e.g. vehicle accidents that are a direct result of negligence by the Contractor). Most of these items effectively fall under standard Construction contract requirements, however.

With regard to the natural environment, the works program is highly restricted in terms of the environmental footprint of the excavation and rehabilitation works. Indicators here will include items such as deaths of individual animals (particularly crocodiles, which are protected), and/or damage to individual trees, areas of native woodland, or even exotic plants along access ways, and in private gardens. These items can either be enumerated directly, or measured on the basis of area damaged during the Contract Works phase.

On the whole, however, most of the environmental will be submitted through Incident Report Forms and the indicators will relate to the levels of compliance/non-compliance in mitigation response by the Contractor.
<table>
<thead>
<tr>
<th>Pt.</th>
<th>Project Activity</th>
<th>Potential Environmental Impacts</th>
<th>Responsibility for monitoring</th>
<th>Proposed mitigation measures</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil (management of excavated and exposed sites)</td>
<td>Prevent accessibility, increased erosion potential in exposed areas, aesthetics, habitat for insects/ disease vectors</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Stockpiling in designated areas, demarcation of sites, covering to prevent water accumulation and application of Environmental Guidelines for Contractors</td>
<td>Stockpiles completed according to EMP requirements&lt;br&gt;Use of fencing or other materials to prevent people/traffic falling into open trenches</td>
</tr>
<tr>
<td>2</td>
<td>Sludge and associated aquatic plant matter</td>
<td>Prevent accessibility, until pathogen content has been determined as low enough to be safe to humans and animals&lt;br&gt;Erosion potential in exposed areas, aesthetics, habitat for insects/ disease vectors</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Test sludge and associated plant matter for pathogen contents&lt;br&gt;Stockpiling in designated areas, demarcation of sites, exposure to sunlight to dry and then ploughing into the existing soils&lt;br&gt;Provide access by local community members to remove useful plant materials (reeds, bulrushes)</td>
<td>Faecal coliform counts in sludge must meet WHO and/or local health authority standards before public access to dried sludge is permitted:&lt;br&gt;$&lt; n$ coliforms/ml of wet sludge&lt;br&gt;$&lt; n$ coliforms/ml of water used to wash standard sample size dry soil and plant samples (e.g. per kg dry matter)</td>
</tr>
<tr>
<td>3</td>
<td>Water Resources Supply (water supply delivery, abstraction rights for ground and surface water)</td>
<td>Lack of water supply to consumers, periodic over-abstraction during low flow season leading to user conflicts</td>
<td>EMO</td>
<td>Water tanker used for surplus emergency supply, increase groundwater pumping if river flows become too low</td>
<td>Monitoring and report back on the daily checklist&lt;br&gt;Feedback from local communities on daily water availability and follow-up on complaints</td>
</tr>
<tr>
<td>4</td>
<td>Water Quality</td>
<td>Discharge of waste water and contamination of water supply and groundwater</td>
<td>ESO (Site-specific), EMO (overall)</td>
<td>Sewerage to precede water supply where both are to be replaced, immediate removal of any spills (availability of septic tanker at short notice)</td>
<td>Regular testing of water quality during the works program, plus monitoring of spills into open water ditches. Where spills occur, take samples and measure faecal coliform levels. Faecal coliform levels must reach National Safety Standards before public access is permitted (as per sample concentrations in row 2 above)</td>
</tr>
<tr>
<td>5</td>
<td>Biota</td>
<td>Loss of vegetation and increased erosion potential, refuge for animals in construction pits, open trenches and materials stockpiles</td>
<td>ESO (site specific) EMO (overall)</td>
<td>Diversion of pipes around vegetation of particular value, selective cutting, removal and proper disposal of all cuttings, monitoring of materials stockpiles</td>
<td>Measurements of areas (m², or ha) of natural vegetation that have been cleared outside of the specific works areas.&lt;br&gt;Death of specific animal species as a result of the works (e.g. crocodiles in the Kafue STW ponds)&lt;br&gt;Compliance in laying out of pipelines and other works infrastructure to avoid areas of natural vegetation</td>
</tr>
<tr>
<td>Pt.</td>
<td>Project Activity</td>
<td>Potential Environmental Impacts</td>
<td>Responsibility for monitoring</td>
<td>Proposed mitigation measures</td>
<td>Indicators</td>
</tr>
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<tr>
<td>6</td>
<td>Local Livelihood Issues/ Development Economics</td>
<td>Reduced/ loss of business potential for street vendors/markets in construction corridor/sites, increased employment opportunities</td>
<td>ESO (site specific)/ EMO (overall)</td>
<td>Designate alternative market areas and facilitate access to infrastructure that temporarily is lost (i.e. public toilets, water taps etc)</td>
<td>This is difficult, but can be determined if traders disclose general income levels prior to starting then project, then income levels during disruptions can be assessed to determine the level of deficit. The indicator is the difference in income compared to a medium to long-term average</td>
</tr>
<tr>
<td>7</td>
<td>Land Use and Tenure</td>
<td>Removal of houses/businesses, reconstruction and resettlement along extensions (peri-urban mainly) Construction of boreholes and water pipelines in arable fields</td>
<td>Local Town Council</td>
<td>Early notification, designate alternative land and issue compensation as specified in Resettlement Policy Framework</td>
<td>Use of social monitoring report forms</td>
</tr>
<tr>
<td>8</td>
<td>Accessibility</td>
<td>Obstructions to traffic, increased potential for accidents</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Demarcation of works/obstacles and detours, traffic control, removal of surplus soils, covering of holes Application of Environmental Guidelines for Contractors.</td>
<td>Compliance by the contractor in demarcating obstacles and availability of detours. If there is a problem, typical indicators would be the average hold-up time for vehicles passing the obstacle on a daily basis</td>
</tr>
<tr>
<td>9</td>
<td>Attractions and Displacement</td>
<td>Reduced/ loss of access along servitude/ extensions</td>
<td>Local Town Council</td>
<td>(see pt. 7 Land Use and Tenure)</td>
<td>As above</td>
</tr>
<tr>
<td>10</td>
<td>Community Cohesion Surveys</td>
<td>Noise and disturbance and increased risk of traffic accidents along access routes</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Demarcation of routes, enforcing traffic regulations</td>
<td>Standard Incident Report Forms completed and submitted Levels of mitigating compliance by the Contractor for all items reported</td>
</tr>
<tr>
<td>11</td>
<td>Health Reports and Statistics</td>
<td>Disease and injuries during the during the proposed works</td>
<td>ESO/ Contractor EMO (overall)</td>
<td>HSE (Health, Safety and Environment guidelines for construction and operations aspects, medical screening and follow-up (Environmental Guidelines for Contractors)</td>
<td>As above</td>
</tr>
<tr>
<td>12</td>
<td>Safety</td>
<td>Construction related accidents (on site, traffic,</td>
<td>Demarcation of sites, posting of signs, traffic control (accident / injury records, traffic counts,</td>
<td>As above</td>
<td></td>
</tr>
<tr>
<td>Pt.</td>
<td>Project Activity</td>
<td>Potential Environmental Impacts</td>
<td>Responsibility for monitoring</td>
<td>Proposed mitigation measures</td>
<td>Indicators</td>
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<tr>
<td>13</td>
<td>Vandalism and Theft</td>
<td>Damage/loss of construction materials</td>
<td>ESO/Contractor</td>
<td>Guarding of depots, community awareness</td>
<td>Incident report forms used to register theft/vandalism</td>
</tr>
<tr>
<td>14</td>
<td>Aesthetics</td>
<td>Spill/dumping, lack of removal and disposal of left over materials (sand, soil), littering (wind-blown waste)</td>
<td>ESO (site)/EMO (overall)</td>
<td>Community awareness, penalties</td>
<td>Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>15</td>
<td>Historical, Archaeological</td>
<td>Conflicts along existing servitude unlikely, potential conflicts in peri-urban areas (e.g. graveyards, churches)</td>
<td>ESO (site)/EMO (overall)</td>
<td>Early notification, community awareness of rights (resettlement compensation policy, see pt. 5 Land Use and Tenure), Seek guidance from Ministry of Culture and Environmental Council of Zambia</td>
<td>Levels of mitigating compliance by the Contractor for all items reported</td>
</tr>
<tr>
<td>16</td>
<td>Air Quality</td>
<td>Spreading of dust, reduced visibility at construction sites, potential noxious smells w/ sewerage replacement</td>
<td>ESO (site)/EMO (overall)</td>
<td>Watering of access routes to reduce dust, avoid/limit access routes through areas with existing heavy traffic/markets/population centres</td>
<td>Dust levels monitored (by the Contractor's site foreman), follow up inspections by ESO Indicator will be the level of failure to comply with dust suppression on sites where this is a problem</td>
</tr>
<tr>
<td>17</td>
<td>Noise Pollution</td>
<td>Construction/blasting noise</td>
<td>ESO (site)/EMO (overall)</td>
<td>Work during day only, best practice (e.g. established guidelines for blasting)</td>
<td>Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>18</td>
<td>Road Maintenance</td>
<td>Increased wear and tear on existing roads, reduced access</td>
<td>ESO (site)/EMO (overall)</td>
<td>Traffic control, adherence to speed limits and recommended loads for construction vehicles</td>
<td>Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>19</td>
<td>Environmental Protection Measures</td>
<td>Ensure sludge from Kafue STW ponds does not flow freely into the Kafue River (distance &gt;250m)</td>
<td>ECZ/EMO</td>
<td>Community awareness, communication – only do desludging in the dry season so the dry ground absorbs moisture from the sludge, and/or ensure sludge is placed next to the ponds so that water settling out of the sludge flows back into</td>
<td>Site inspection during rehabilitation works. Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>Pt.</td>
<td>Project Activity</td>
<td>Potential Environmental Impacts</td>
<td>Responsibility for monitoring</td>
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<tr>
<td>20</td>
<td>Contractor / Consultant Training</td>
<td>Improve mitigation/ enhancement and compliance monitoring</td>
<td>EMO / Consultant</td>
<td>Prepare and conduct training program (no. of materials prepared, no. of participants)</td>
<td>Levels of mitigating compliance by the Contractor for all items reported</td>
</tr>
<tr>
<td>21</td>
<td>Mitigation / Enhancement</td>
<td>Avoid negative impacts (e.g. pollution degradation of resource base, improve development potential)</td>
<td>EMO</td>
<td>To be facilitated and emphasised as part of training and compliance monitoring / post construction audit (no. planned / done, contracts record)</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>22</td>
<td>Development Projects</td>
<td>Accessibility to sites, availability of personnel</td>
<td>Local Town Council / EMO</td>
<td>Advisory group feedback, ratio of tasks</td>
<td>Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>23</td>
<td>Environmental Management</td>
<td>Inefficiencies in implementation, confusion of tasks and responsibilities, and risk of delays and exceeding of costs</td>
<td>ESO / Contractor EMO (overall)</td>
<td>Evaluations, careful planning of /, effectiveness ratings</td>
<td>Standard Incident Report Forms completed and submitted</td>
</tr>
<tr>
<td>24</td>
<td>Contractor Requirements</td>
<td>Risk of unnecessary costs with lack of specificity and negligence of EMP for items not costed</td>
<td>ESO (site) / EMO (overall)</td>
<td>Proper construction supervision, compliance monitoring</td>
<td>Levels of mitigating compliance by the Contractor for all items reported</td>
</tr>
<tr>
<td>25</td>
<td>Local Employment and Supplies</td>
<td>Risk of increased number of sex workers and spreading of STDs with temporary/ migrant labour</td>
<td>ESO / Contractor EMO</td>
<td>Community awareness, promotion of condoms, health screening</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>26</td>
<td>Borrow Pit Rehabilitation / Protection / Mining of river sand</td>
<td>Erosion and risk of accidents with open pits and exposed soil (see also pt. I soils)</td>
<td>ESO (site) / EMO (overall)</td>
<td>Demarcation of sites, work during the dry season Seek alternative sources for sand for construction purposes</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>27</td>
<td>Landscape Re-vegetation</td>
<td>Loss of cover/ shade and soil support, increased erosion risk</td>
<td>ESO (site) / EMO (overall)</td>
<td>Selective cutting and rapid re-planting / slope stabilization where applicable</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>28</td>
<td>Wastes</td>
<td>Pollution risk with</td>
<td>ESO (site) /</td>
<td>Establish and conduct training program (No.</td>
<td>Actions completed can be signed off on the</td>
</tr>
</tbody>
</table>

**Proposed mitigation measures**

- Prepare and conduct training program.
- To be facilitated and emphasised as part of training and compliance monitoring.
- Proper construction supervision.
- Community awareness, promotion of condoms, health screening.
- Demarcation of sites, work during the dry season.
- Seek alternative sources for sand for construction purposes.
- Establish and conduct training program.

**Indicators**

- Levels of mitigating compliance by the Contractor for all items reported.
- Standard Incident Report Forms completed and submitted.
- Levels of mitigating compliance by the Contractor for all items reported.
- Actions completed can be signed off on the register of items to be done by the Contractor.
<table>
<thead>
<tr>
<th>Pt.</th>
<th>Project Activity</th>
<th>Potential Environmental Impacts</th>
<th>Responsibility for monitoring</th>
<th>Proposed mitigation measures</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Management Reports</td>
<td>unaccounted for waste/ improper disposal</td>
<td>EMO (overall)</td>
<td>facilities, No. trainees, Pollution Records, Disposal</td>
<td>register of items to be done by the Contractor</td>
</tr>
<tr>
<td>29</td>
<td>Resource Protection</td>
<td>Risk of loss/ degradation of land/ soils, vegetation with uncoordinated implementation of proposed works</td>
<td>ESO (site)/ EMO (overall)</td>
<td>Designate/ prioritize conservation sites, formalize land use</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>30</td>
<td>Archaeological Protection</td>
<td>Potential conflicts along extensions (mainly peri-urban areas), lack of awareness of conservation worthy sites</td>
<td>ESO (site)/ EMO / Specialist (overall)</td>
<td>Prepare and conduct training program (No. training Sessions, No. Artefacts, Frequency, Activities of archaeologist involvement)</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>31</td>
<td>Consultations with Local Officials</td>
<td>Lack of information/ communication, negative perceptions of impacts/ benefits</td>
<td>EMO/ LWSC spokes person</td>
<td>Record keeping, awareness creation ( e.g. no. types, contacts / decisions made records)</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
<tr>
<td>32</td>
<td>Co-operation on Environmental Program</td>
<td>Increased risk of pollution and accidents without co-operation</td>
<td>ESO, Contractor EMO, LWSC</td>
<td>Establish contracts, awareness creation communication (record, evaluation scale)</td>
<td>Actions completed can be signed off on the register of items to be done by the Contractor</td>
</tr>
</tbody>
</table>
APPENDIX A: PEOPLE CONSULTED & REFERENCES, ESMF TEAM

List of Persons Met During Preparation of the Environmental and Social Management Framework (ESMF)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. Herbert Chinokoro</td>
<td>Project Manager</td>
</tr>
<tr>
<td>14</td>
<td>Mr. Jilly Chiyombe</td>
<td>Senior Engineer - Projects Unit</td>
</tr>
<tr>
<td></td>
<td>Mr. Ngenda David</td>
<td>Water Engineer</td>
</tr>
<tr>
<td></td>
<td>Mr. Michael Chileshe</td>
<td>Water Engineer</td>
</tr>
<tr>
<td>15</td>
<td>Mr. Nyirenda</td>
<td>Operations Manager and Zonal chairperson-Chilanga Game and Fisheries</td>
</tr>
<tr>
<td>16</td>
<td>Mr. John Shitima</td>
<td>Zonal Chairperson -Soweto Compound,Luangwa</td>
</tr>
<tr>
<td></td>
<td>Mr. Mubiana</td>
<td>Chair person chongwe Main Market</td>
</tr>
<tr>
<td>17</td>
<td>Mr. Zimba</td>
<td>Chair man Shikoswe, Kafue</td>
</tr>
<tr>
<td>18</td>
<td>Mr. Augustine Lupenga</td>
<td>Inspector EIA</td>
</tr>
<tr>
<td></td>
<td>DWA/WRAP</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Mr. Christopher Chileshe</td>
<td>Acting Director, DWA</td>
</tr>
<tr>
<td>20</td>
<td>Mr. Jack Nkhoma</td>
<td>Senior Hydrogeologist</td>
</tr>
<tr>
<td>21</td>
<td>Mr. William Ndhlovu</td>
<td>Assistant Director, Public Health and Social Services</td>
</tr>
</tbody>
</table>

Additional lists of people met during interviews is supplied in Appendix C and D, which includes the report-back from the Sociologist and the Health & Safety specialist.

ESMF Team

Mr. J Knudsen: Team Leader/Hydrogeologist
Mr. J N Burgess: Environmental Specialist/Ecologist
Mrs. Harriet Ntalasha: Sociologist
Ms. Constance Mulenga: Environmental Health & Safety Specialist

Workshop

The Consultative Stakeholder Workshop was held in Lusaka on the 4th of July. The following issues were highlighted:

- Chongwe District Council - The Council wanted to know what measures the project intended to put in place concerning sewage disposal. Measures need to be put in place to treat and reduce effluent on the Chongwe River as the Lusaka industrial waste outlets all flow into it.

- The issue of project ownership was highlighted as a major concern when dealing with the impact on environment. E.g. Lusaka City Council should co-fund some areas of development because they will benefit from the project (Kaunda Sq sanitation and water reticulation improvement). In this case – development of plans for future expansion of waterborne sewerage effluent disposal from dense housing areas – as more piped water is supplied – this will become a problem (medium to long term).

- RE the RPF (Appendix 5), there is one case where a business owner has self-allocated land within an existing wayleave corridor (under a power line and over an existing rising main). Technically the developer could be ordered to dismantle the property, but it is entirely feasible to bypass the
issue by rerouting the pipeline (due for excavation and replacement) around the building and blocking off the original pipe, leaving it in the ground.
APPENDIX B: GIS MAPPING AND SITE PHOTOS
APPENDIX C: SOCIO-ECONOMIC FINDINGS REPORT

This section of the report presents data on the socio-economic assessment of the proposed water and sanitation improvement project in the three small towns of Kafue, Chongwe, and Luangwa. Data collection was done through both individual interviews and group discussions in the various affected communities. Additionally, the research team visited all the affected areas so as to have site specific assessments of possible impacts. The details of the findings are presented below.

KAFUE-Nangongwa

Issues raised on current situation

- Very poor sanitation situation
- Raw sewerage flowing in the open ditches within the residential area – health risks (children found playing with sewer water) etc.
- People exposed to bad odours
- The sewerage ponds are very close to residential area (planned resettlement)
- A lot of gardening (growing of vegetables and sugar cane using sewerage water – with associated health risks)
- The treatment ponds have are heavily silted up
- The main sewerage pumping system has broken down
- People are not happy with the water supply billing system – different bills are issued for people using the same tap
- People are receiving bills even when there is no water, after disconnection of water supply,
- Disease outbreak very common.
- The toilet at the Market has been closed for the past three months due to lack of water- creating a high risk of water borne disease
- The quality of water supplied is very poor because of contamination from broken sewer pipes and mixing of fresh and sewerage water.
- Old bills are not genuine; people feel that all these should be cancelled so that they can start on a fresh note with LSWC.
- There are communal taps, toilets and bathrooms consisting of 4 Households (the meaning is not clear here) – leading to congestion and fights, blocked sewers (facilities designed for a smaller population during colonial period, but population has since grown)
- Erratic Water Supply
- Some people, for example in Kaseva housing area have paid for water but up to now they have not been connected

Perceived Negative Impacts

- Relocations of settlements close to the sewer ponds (compensation) and consequently loss of established social networks within the community (not necessary if the pumps are installed and the old ponds closed/bypassed)
- Noise, dust during rehabilitation and extension work
- Inconvenience to the public (traffic and pedestrians) during trench excavations
- Trenches create potential for serious accidents if left open for a long time, could be breeding place for mosquitoes during the rainy season
- Temporary shut-down leading to disturbance of water supply and sewer operations
- The dredged silt from ponds could be health risks if not properly handled

Suggestions to minimize impacts

- Contractors to provide timely notification to the public so as to minimize effects
- If works will be done during dry season dampening of ground necessary to reduce dust
- Works to be undertaken during the day to reduce impact of noise
- Work not to take too long so as to avoid accidents from dug out trenches.
• Remove dredged silt to the main STW drying ponds for composting

**Perceived positive impacts**
• Employment opportunities for the local people
• Improved water supply and sanitation
• Dredged silt could be used as composite for the surrounding communities (after tests)

**Willingness of people to pay for improved water supply**
• People are willing to pay for water
• There is a preference for meters

**KAFUE-Zambia compound**

**Issues raised on current situation**
• Raw sewer flowing in the open within the residential area – health risks (children found playing with sewer water) etc.
• People exposed to bad odours
• Zambia compound currently depends on communal stand taps – but these are not enough, only a few are working leading to congestion, quarrels and fighting erupting which is a threat to community cohesion, people waking up as early as 04:00hrs to queue for water. The whole community only has 9 taps that are functional
• targeted for on site sanitation
• Some residents have put up individual taps and other residents drawing water from these taps pay between K1000-K2000 while owners pay K20,000 a month
• Those using communal taps- free but make contributions for maintenance through their sub committees
• Erratic supply of water- sometimes people can go the whole day forcing people to draw water from the river about 5Km away; the water is not clean, looks like tea with particles
• Those who cannot walk to the river, get water from shallow wells-risk of diseases
• Water lines too far for most people to make individual connections- too expensive - K1 million
• The whole of zone 6 has no water
• At market prefer fixed charge, households meters prefer but if to pay a fixed charge of K3,500 per household, they would prefer fixed charges (as agreed in a workshop, but not entirely clear).
• Depend on pit latrines- but since these are not emptied they overflow, therefore more toilets are needed – many people practice poor sanitation which leads to disease out-breaks
• Blocked and broken sewer pipes, raw sewer flowing in the Zambia Compound - leading to disease outbreaks
• Cost of piping is too expensive so most people cannot have flush toilets- the whole of Zambia Compound only has 5 flush toilets
• There are no Council Drawing plans, so people build on water lines. If they could be compensated the affected households would agree to move to other areas.
• Water only comes at fixed times/very short period - load shedding contributing to this problem
• People would prefer provision of a single tap per household

**Perceived negative impacts**
• Disruption of water supply
• Dust and noise
• Loss of business for people in the market
• Trenches if left open far too long could result in serious accidents and provide breeding place for mosquitoes if left open during the rainy season

**Suggestions to minimize impacts**
• Timely notification for the public to be given on rehabilitation work.
• Trenches should not be left open for too long to avoid accidents

**Perceived positive impacts**
• Employment opportunities for the local people
• Improved water supply and sanitation in the area
• More people will be willing to come and rent houses in Zambia Compound with the potential for improved business for house owners
• A healthier urban environment and reduced risks of disease out breaks

**Willingness of people to pay for improved water supply**
• People are willing to pay but charges have to be reasonable considering that most of the residents are not working or have very low incomes
• People agree to have the inconvenience of water supply and sanitation trenches as long as there is an improvement in water supplies and sanitation

**KAFUE- Shikoswe**

**Issues raised on current situation**
• The whole of Shikoswe needs to have water-borne sewerage lines installed
• Water supply line extensions are required in Shikoswe
• Shikoswe depends on pit latrines and septic tanks, septic tanks do not work effectively because the water table is too shallow, the situation gets worse during the rainy season, so septic tanks overflow
• People are required to pay for their own sewer pipes, while most people can’t afford this

**Perceived negative impacts**
• Some networks may pass through people’s plots
• Trenches if left open for too long can cause accidents and provide breeding places for mosquitoes and spreading of malaria during the rainy season

**Suggestions to minimize impacts**
• Timely notification to the public of extension work
• Work not to take too long

**Perceived positive impacts**
• Improved sanitation/sewer system for Shikoswe
• Water extensions
• Water provision especially for new Shikoswe

**Willingness of people to pay for improved water supply and sanitation**
• People are willing to pay for water as long as the water supply and sanitation situation is improved in the area

**KAFUE Estates**

**Issues raised on current situation**
• There has been no water supply at the market - due to broken pipes - for over three years, though taps are there, including taps in each shop
• Household water supply is only available for a few hours each day
• There is only one toilet at the market with no cistern, people pay K1000 per day per shop and K300 per visit to toilet but the Council has been unable to repair the broken pipes and toilet
• Water pressure is very low – which is a particular problem for people living higher up
• Most people are not able to afford the water fees of K30,000 per month as there is currently very little employment (most people are former NCZ and Kafue Textiles employees)
Many households have already been disconnected
Problem of extension of sewer and water lines won’t arise because there are no illegal buildings and extension of houses in the area

### Perceived negative impacts
- Interruptions of water supply
- Trenches can cause accidents, can be used as dumping ground

### Suggestions to minimize impacts
- The contractor to provide notices for the public about ongoing works
- Working period not to be prolonged

### Perceived positive Impacts
- Improved water pressure
- Longer hours of water supply

### Willingness of people to pay for improved water supply
- Although most of them are out of employment, all are willing to pay because they understand that it is the only way a company like LSWC can be able to carry out its operations effectively

### KAFUE - General
- Some pump stations that are operational have been temporarily restored, but they still need complete replacement e.g. pump station No. 3
- Pump station No. 5 (within the steel plant compound) is completely broken down. The pump house had to be punctured to allow raw sewage to flow into the drainage system and released in the open environment
- Some pump stations e.g. pump station No. 5 have been vandalized by residents
- Blocked sewer lines are also common in the area, mainly due to build up of solids in the pipes
- The STW ponds at main pump station are silted, clogged with weeds and infested with crocodiles – posing health and safety risks for nearby households, passersby and LWSC workers.
- Sewerage ponds (at the main pump station) are not very far from the Kafue River
- Water extensions (to new houses (C7) required
- Settlements (2 houses) very close to the sewerage pond
- Water supply lines have a lot of leaks (starting with the intake)
- A lot of water losses from leakages result in to low mains pressure, part of main pipe is submerged in water – possibly resulting in contamination of water
- Water extensions are required to new plots (C6)

### Perceived negative impacts
- Disturbance to traffic because rehabilitation works will cut through some roads
- Disturbance of water supply during temporary closure
- Part of leakage just at the entrance of a lodge resulting in loss of business during rehabilitation work

### Suggestions to minimize impacts
- Timely notification for the public
- Renovations to be done in a speedy manner to avoid prolonged inconvenience to the public

### Perceived positive impacts
- Improved water and sewer system for the whole of Kafue
- Reduced possibility of human disease; reduced risks of people losing lives from being attacked by crocodiles at main sewerage ponds The dredged silt could be used as composite mammal for local communities
The weed from the ponds could be used as live fencing, making of baskets and marts (communities already using the weed for live fencing)

**KAFUE - Chilanga Township**

**Issues raised on current situation**

**Water**
- Security at the pump station is very poor
- The pump house is dilapidated
- A lot of water is wasted at the pump house, with too many activities e.g. growing vegetables and brick making by a youth group within the pump house area
- Currently only 1 pump is working (instead of 2), so there is no standby pump, this could lead to problems if the only working pump breaks down
- An additional borehole already drilled on site which only needs confirmation and testing – it is possible the well is blocked and may have to be re-drilled
- Currently, no water treatment is being done
- The storage reservoir needs to be tested to confirm whether there are any leakages. If so, rehabilitation work will be done
- Currently the reservoir is not filling up because of increased pressure on the line – there are a lot of pipelines tapping directly off the line taking water into the reservoir
- There are 260 new houses needing water supply

**KAFUE Chilanga Game and Fisheries**

**Issues raised on current situation**

**Water**
- Game and Fisheries residential area has not had water supply for years
- The only hand pump has also broken down
- Residents of Game and Fisheries have to walk long distances to access drinking water, some people have to cross the main road, which is dangerous
- Residents of Game and Fisheries depend on water from the stream and the dam for washing and laundry
- The lack of security at the pump house has resulted in the recently installed LWSC pump being stolen
- The pump house is dilapidated
- The two small reservoirs are in very bad state and need immediate replacement

**Perceived negative impacts for both Chilanga Township and Game and Fisheries**
- Rehabilitation work may lead to temporary disruption of the water supply
- Inconvenience for the public in terms of traffic and pedestrians as some rehabilitation and extension of network will cut through roads
- A shop is under construction at Chilanga Pump station is on top of line demolition/compensation
- The Youth group may lose a source of income

**Suggestions to minimize impacts**
- The Youth group should be given ample notification so that they can find an alternative site for their business
- Timely notification to the public to avoid inconvenience in works areas

**Perceived positive impacts**
- People to have access to clear and safer drinking water
- Local people to have access to employment during rehabilitation work
- Reduced possibility of human diseases resulting from use of contaminated water
• Access to improved, more dependable water supply.
• Reduced risks of accidents to people crossing the main road in search of water.
• Improved security to pump houses
• Reduced wastage of water and improved pressure.
• The 260 new houses will be connected to the water line

Willingness of people to pay for improved water supply and sanitation
• People will be willing to pay for improved water supply
• Willingness for people shown when all households made contributions to recover a stolen pump

CHONGWE:
Issues raised on current situation

Sanitation
• Currently the situation is poor
• Most households depend on traditional pit latrines and septic tank systems
• Pit latrines are more reliable than the septic tank system due to erratic supply of water, so nearly all houses have stand-by pit latrines.
• A number of septic tanks are overflowing because there is no one in charge of emptying them. This has been left to individual households, most of whom cannot afford to have the latrines emptied.
• The local authority does not have the capacity to provide the service

Water
• There is currently no water filtration or treatment system in Chongwe
• Therefore the quality of water is very poor, people are using contaminated water for bathing and laundry, cooking, directly from Chongwe River which is contaminated from Lusaka through the heavily polluted Ngwerere stream (the outflow from the Kaunda Square sewerage ponds is into this river) with faeces, dead bodies and dead dogs being dumped there
• Use of contaminated water poses very significant health risks
• The water supply is erratic and water pressure low because the original network was designed for a smaller population. Additionally, corrosion and blockages occur in the pipes due to the age of the water supply system. The dam is heavily silted, and water extracted for the Chongwe water supply is contaminated with soil particles, worms and faecal matter which are visible even at the off-take points (taps)
• The situation is worse during rainy season.
• There are too few boreholes - people are required to walk long distances to get drinking water
• All bath water has to be boiled to avoid itching – which requires too much (heating) energy for poor households
• Though sensitization of communities has been done by both RHC and the local authority, some households use the same contaminated water for drinking and cooking due to the long distance to boreholes to fetch clean water, some residents have to walk 1km to the nearest borehole
• Communities downstream use contaminated water for all households. A lot of vegetables are being grown by Zambia National Service located downstream using the same water
• Chlorination of the water is not properly done (chlorine put directly into the system) so the concentration is very high at households close to the pump station and lower the further away from the treatment tanks that the off-take points are.
• A lot of households have been disconnected, some of them now resort to getting water from shallow wells, with the associated risk of contracting diseases
• The current billing system is unfair and unreasonable, with bills being received even when there has been no water for months or water has long been disconnected (some as long as 6 months)
• Water is very expensive at K35,000 per month, and bills are too high, going up to K250,000 – K300,000 so, people end up digging shallow wells to obtain water
People are experiencing diseases such as coughing, diarrhoea and skin itching after bathing in unboiled water
Lubuko area has stand tap water and people pay K35,000 to use this
The Council uses plastics to disconnect defaulters, this leads to blocking of pipes.
People pay on 30th of every month while bills are delivered on 15th and disconnection fees are charged without actual disconnections
There is a general feeling that vulnerable people are being exploited because bills are not verified
There is no customer relationship
People are given 4 days in which to pay their bills and K100,000 is charged for reconnection. They feel that the fee is too high and the notice period is too short.

Perceived negative Impacts
- Disruption of water supply during temporary closure for the upgrading works
- Noise and dust during rehabilitation and extension work for nearby communities
- General inconvenience to road users as some roads may be temporarily affected
- Extensions will pass through peoples plots
- Trenches if left open for too long could result in serious accidents and provide breeding place for mosquitoes if left open during the rainy season
- (as above) Loss of cropland, particularly near to the dam as space will be required for placing of silt from the dam and expansion drilling of new boreholes NB, the borehole sites are in LWSC’s site which is being ‘borrowed’ by local people to grow crops in. And, the silt deposition would only go onto the land in a totally separate location, IF it is ecologically and economically feasible – in terms of improving the agricultural production potential of the land. The negative impacts can be avoided by timing the desilting to coincide with the end of the harvesting period
- River diversion during rehabilitating work could also lead to loss of cropland.
- People living close to the dam are likely to be temporarily displaced to give way to the construction works. The extent of such relocation will have to be determined once the engineering methods have been established.
- Rehabilitation work will lead to temporary disturbance of the water supply in Chongwe
- Open trenches will be a problem if they are left open for too long (i.e. before water pipes are provided)
- Accidents/children can fall in trenches, as well as making them toilets, and a dumping ground for rubbish.
- Fruit trees near the dam and on borehole sites may be disturbed/destroyed

Suggestions to minimize impacts
- Trenches should not to be left open for too long and should be clearly demarcated or fenced off and notices put up to advise people
- Need the services of a soil scientist to test the fertility of the silt to see whether local communities can use it for crop production
- Consultation with local community on the potential use of silt if it is found useful/suitable
- The public need to be informed of rehabilitation work so that they may store enough water before the supplies are shut off
- as above
- Timely notification on rehabilitation work necessary for the public so that road users may find alternative routes and people can store enough water
- Digging of trenches to be done during dry season, water dampening required to avoid too much dust
- People with fields close to the dam need to be informed in time so that they do not plant anything. If works will be after planting has already been done, work should commence after people have harvested
- People to be compensated for loss of cropland
- Avoid as much as possible the disturbance of fruit trees close to the dam, avoid cutting down of fruit trees close to the treatment plant – fruit trees take a very long time to be established
The various contractors engaged should do works in stages/phases to minimize impacts. Avoid as much as possible relocations, where relocation is the last resort, compensation necessary to cushion those affected.

**Perceived positive impacts**
- Employment opportunities for local communities
- Improved quality of water
- Improved access to water supply
- Improved sanitation
- Reduce risks of contracting diseases from use of contaminated water, eat safer vegetables, grow using safer, cleaner water

**Willingness of people to pay for water:**
- People have for years paid for contaminated water and would therefore be more than willing to pay for cleaner safer drinking water.
- People prefer meters so that they are charged according to what they use.
- People agreed that the Council can be allowed to dig drainages while laying pipes for clean water on their plots so that they can have access to clean water.

**LUANGWA-TOWNSHIP AREA**

**Issues raised on current situation**
- There is only 1 pump at the intake - in the event of breakdown this can lead to disruption of water supply.
- Therefore a need to install another pump to act as a standby.
- Need to put some guard rails at the intake to avoid people slipping into the river.
- Need replacement (1Km) of rising main.
- The underground reservoir (not on the list) needs some rehabilitation of the roof.
- Security at the reservoir is very poor.
- The water treatment filters need rehabilitation so as to improve efficiency, currently they are working, but not effectively.
- The upright reservoir (Braithwaite tank?) also needs some rehabilitation.
- In terms of sanitation, people use ordinary pit latrines, VIPs and septic tanks.
- The borehole and reservoir in Soweto residential area needs to be worked on – reservoir leaking and the borehole water is saline, and may have high fluoride levels in it.
- This reservoir will be connected to the main supply line.
- Though residents particularly those who have lived in the area for a long time have no complaints concerning the salty water.
- The water needs to be tested for health risks exposure.
- Residents depend on communal taps and pay a monthly charge of K4,500 per household per month.
- Future demand for water supply is ensured as the area where the new line will pass has already been allocated for building.

**Perceived negative impacts**
- Replacement of the 1 Km of rising main will be done manually, so will require only a small working corridor.
- Possibility of water disruptions during rehabilitation – but if done quickly there is enough storage at the water treatment works site to last a few days.
- Noise and dust for a few households along the rising main.
- Rehabilitation of rising main will not disturb traffic because it will not cross any road
- The new pipeline connecting the reservoir at the salty borehole to the main water system will cross the road - there will some inconvenience to road users if trenches are left open for a long time
- Possibility of noise and weakening of buildings if blasting is done while putting up the new line (the area is too rocky)

**LUANGWA-SOWETO COMPOUND - SALTY BOREHOLE**

**Issues raised on current situation**

- The area has more than 1,000 people including people from Kamoba
- The salty borehole was sunk in 2001
- Before that people used water from a hand pump which at the moment is not working efficiently. The borehole was sunk by JICA
- When the salty borehole was first sunk water was free
- After 2 years, residents were required to pay K3,500 for water and K500 for borehole maintenance
- The water is bad because it is salty
- People drink the water because there is no other reasonable water supply option
- Some people got sick (reported kidney problems) after a long time of using the water
- Immediate reactions resulting from using the water is stomach upsets
- As a result some people are forced to walk long distances to Luangwa river to get better water
- Newcomers to the area fail to drink the water because of the bad taste
- Residents are unable to use the water to prepare local brew known as Munkoyo because of the bad taste
- Even preparation of Nshima and beans using the water is made very difficult (Nshima turns yellow and is very difficult to prepare, taste of beans is bad)
- Residents unable to do gardening to grow fruit trees (orchards) because they die if watered using the salty water
- As a result hunger people are unable to supplement their diets with locally grown fruit and vegetables within their housing yards and are susceptible to food shortages (this is a high risk area)
- Even to bath, one needs a lot of soap – which is costly
- Clothes do not last when washed in this water (they tear up very fast)
- Some people have to take baths in Luangwa River
- People depend on one communal stand pipe – which is not enough because people from the nearby residential area of Kamoba also depend on the same tap, so there has been a lot of congestion and a lot of fighting erupting at the tap.
- People have to work up as early as 04:00 hours to avoid the congestion at the water supply tap
- Residents find it difficult to monitor payments for water because there are too many households depending on the communal tap
- Residents would prefer that there is a stand pipe for every 20 households so that everybody pays for water
- One standpipe is not enough
- Some people have to climb a steep slope with buckets of water – so piped water and more taps are needed
- People would prefer water from the Zambezi because it tastes better
- The 2km connection between Soweto Compound and the main water supply will pass through an area where people have already been allocated plots, this will mean a lot of tap offs from this line and hence low pressure for people of Soweto compound – not necessarily true!
**Perceived negative impacts for both Luangwa Township and Soweto**
- Disruption of water supply
- Dust and noise during blasting as the area is very rocky
- Trenches could cause some inconvenience to a few households

**Suggestions to minimize impacts**
- Trenches not to be left open for too long
- Notification to the public about rehabilitation and extension work necessary
- Work to be done during the day

**Perceived positive impacts**
- Improved water supply and water with better taste
- Casual employment for local youths
- Security at reservoir (main reservoir) will improve
- With a standby pump secured, less possibilities of water disruption
- More access to water with increased number of boreholes
- People of Soweto (Salty borehole) will be able to grow vegetables and fruits – not necessarily true, the soils have naturally high levels of salinity – shown by localized gulley erosion and specific tree species such as Mopane. Also, they would have to pay extra for using treated water for irrigating vegetables. [They could possibly look at using grey water and composting techniques for watering vegetables etc. The soap in the grey water will bind with the salts in the soils and add phosphates]
- Income from the sale of vegetables etc. can be used for other domestic needs including paying of school fees
- Less health risks from drinking salty water
- More community cohesion as there will be no more fights among residents over water.
- Reduced time spent on drawing of water, time left for other productive activities

**Comment**
Despite the many negative impacts identified from rehabilitation of sewer and installations and network extensions, all the people where rehabilitation and new networks are supposed to take place stand to benefit; i.e. positive impacts will be greater than negative impacts because of the current situation. Additionally, all the identified negative impacts can be managed so as to minimize effects.

In terms of willingness to pay for improved water supply and sanitation all the people interviewed are willing to pay as long as the water and sanitation problems they are currently experiencing are sorted out.

**LIST OF PEOPLE CONSULTED**

1. Mr. Nyirenda M.A., Operations manager and Zonal Chairman - Chilanga Game and Fisheries
2. Mr Nasilele., Deputy District Secretary - Chongwe District Council.
3. Mr John Shitima., Zonal Chairman, Soweto Compound, Luangwa.
4. Mrs Bwalya., Chilanga (affected)
5. Mr Mubiana., Chongwe Main Market Chairman
6. Mr Zimba., Shikoswe (Market Chairman)

**Group Discussions**

**KAFUE Estates Market Committee**
1. Mr Zimba Chair man
2. Mrs Lent Malambo V Chairperson.
3. Mr Gondwe Treasurer

**Nangongwa Market-Kafue**

1. G. Kondowe  
2. C. Maspa  
3. M. Lungu  
4. C. Chisi  
5. M. Lubingo  
6. M. Kayombo  
7. J. Chibesa  
8. A. Sianga  
9. J. Chanda  
10. M. J. Banda  
11. M. Moyo  
12. K. Kapito  
13. Mrs Manyepa  
14. Mrs Phiri  
15. Mrs Likezo  
16. Ms. Chaithila  
17. Mrs. M. Banda  
18. Mrs M. Michelo  
19. J. Chibesa  
20. Mrs Mulenga  
21. Mrs Mwanza  
22. Mrs D. Mwanza  
23. Mrs Zulu  
24. Miss Kapungwe  
25. Mrs C. Pemba  
26. Miss G. Chanda

Male: 13 Female: 13

**Zambia Compound**

1. Mr D. Mwansa  
2. Mrs. J. Maliko  
3. Mr W. Libonga  
4. Ms A Banda  
5. Mr T. Mbewe  
6. (List incompe)

**LUANGWA Focus Group**  
27/06/08

1. Ibah Sakala  
2. Angela Mwanza  
3. Mavis Banda  
4. Christina Mumba  
5. Anna Phiri  
6. Jesinala Phiri  
7. Vikitoli Tembo  
8. Maileya Tembo  
9. Telesa Zulu  
10. Maliya Malungu  
11. Nkole Yuma  
12. Elias Banda
13. John Shitima
14. Yusuf Sakala
15. Joseph Phiri
16. John Tembo
17. Alfonso Tembo
18. M. Phiri
19. Suzen Sakala
20. Anna Tembo
21. Christina Phiri

Male: 8    Female: 13

CHONGWE Main Market
28/06/08

Mr. Odinga Mwanza
Mr. Simon Munga
Ms. Munkomba
Mrs Chasha
Ms. Suzana Kasofu
Mr Lovemore Banda
Mr. Albert Sinkwaya
Mr Munkombwe Nchimunya
Mrs Mbulo
Mrs Kaonza
Mr. Mubiana

Male: 6 Female: 5
APPENDIX D: PUBLIC HEALTH & SAFETY FINDINGS REPORT

The following are the findings from the field tours and the interviews conducted in line with the Environmental Impact Assessment of the Water Sector Performance Improvement Project (WSPIP) for the Water and Sanitation Services in three (3) districts (Kafue which also includes Chilanga, Chongwe, and Luangwa).

1.0 KAFUE

1.1 Description of works
✓ Repairs to water treatment plant, the river intake and pumps
✓ Repairs to pipe work at reservoir and the transmission mains to consumers
✓ Extensions of water supply networks to provide for more consumers
✓ Repairs to sewer pump stations and sewer lines, extensions to the system
✓ Provision of water meters and valves for management and measurement
✓ 5 Peri urban sanitation demonstration- pilots

1.2 Issues Raised/current situation
✓ Replacement of sewage pump station No. 4 at the sewage works.
✓ Sewage ponds are clogged with weeds and also highly infested with reptiles such as crocodiles and alligators, which were evident at the time of the tour.
✓ The ponds need de-weeding and dredging
✓ There are two houses within the buffer zone of the sewage ponds
✓ The clogged ponds are not operational, therefore waste water is discharged into the Kafue river
✓ Sanitation demonstrations to be done on the sewage works premises
✓ In Nangongwe settlement, raw sewage was flowing in open drains, a sign of blockages.
✓ Some houses in Nangongwe settlement are within a distance of 100 m and the ponds are not secured, which prompts the residents to be using sewage to water their vegetable, bananas and sugarcane gardens
✓ At these ponds Pump station No. 6 is not operational, hence waste water (sewage) is discharged through the open drains to the Kafue river
✓ The ponds need de-silting because they are evidently shallow. There is little space o provide for drying the silt
✓ Zambia Compound pump station No. 3 Lumumba area was operational, the panel was restored temporarily. Need to replace the panel and electrical. When the pump is not operational sewage overflows draining into the sugarcane fields
✓ Onsite sanitation demonstration to be replicated to Zambia compound
Sewage pump station No. 2 in Mtendere; a portable panel and one pump running temporarily which needs replacing. No has been coming from estates because the pumps are not functional.

Industries using onsite sanitation

Sewage pump station No. 1 located within Kafue’s Universal Steel Company servicing community 5 and 6. Needs complete panel replacement. The structure has been punctured allowing the raw sewage to be discharged through an open drain into the environment.

There are 26 onsite (septic tanks) latrines servicing the plant. This plant is still under construction and it is estimated that about 3500 people are going to be employed which adds on to the existing population of Kafue.

It was also discovered during the interview that the management of the Steel Company intends to construct 200 housing units in Mungu Ward, that need a plan for both water and sewerage, hence the need to not only rehabilitate but also take care of the expansion program.

Pump station No. 5 servicing C7 (Kafue Estates). The pumps are working but the problem with the panel. Experiencing blockages and backflows due to the pump station not working.

Sewerage extensions to the new houses in C6 and C7

Water extensions to the new housing units in C6 and C7

Shikoswe area is on septic tanks but there is a problem with the water table which is high, hence the problem of overflowing septic tanks in the rainy season.

Problem with water lines and looping in Shikoswe area

Town area needs repairs to water pipes. There was evidence of corroded pipes and leaks in specific places.

Evidence of faecal matter on the ground in an area near the Kafue Steel Company; a sign of insufficiency of sanitary facilities.

Water intake pumps need replacing, and mechanical and electrical repairs to the existing ones. Intake pipe leaking.

Water treatment plant need rehabilitation in the following areas: sedimentation tanks; filters and replacing the sand. Rehabilitation to be done in stages, hence no complete water interruption.

Replacement of the current old pumps with new ones, one pump supplied by LWSC but not yet commissioned.

Chemical room (chlorination room) rehabilitation, water to be stored in reservoirs, only about 17% reductions in daily flow.

Leaking pipes submerged in ground water; in cases when the water pressure is low, the pipes suck all the water around the pipes back into the pipes, hence causing contamination of already treated water.
1.3 Impacts

- Replacement of sewage pump station No. 4 at the sewage works will call for interruption of the flow of sewage from the served areas, hence causing blockages which will lead to bad odours, contamination of the surrounding environment, causing a public nuisance in accordance to the Public Health Act Cap 295 of the Laws of Zambia.

- Dredging of the sewage ponds will impact both on the health and life of the operators. In terms of health, the risk of contracting disease if not well protected; whereas, in terms of life, the risk of being attacked by the reptiles (i.e. crocodiles, alligators, snake etc.).

- Health risk of contracting diseases from the highly contaminated silt if not properly handled during the de-silting or dredging process, depending on the methodology employed.

- Impact of contaminating the soil around the pond, i.e. the area under the power grid (Pylons).

- Impact of displacing the households that are within the buffer zone of the sewage ponds.

- In Nangongwe settlement, noise disturbances are anticipated to the people living too close to the sewage ponds.

- Impact of contaminating the soil around the sewage ponds if silt is going to be dried on site.

- Interruption in the flow of sewage when extending sewerage to the new houses in C6 and C7, will cause overflows of sewage into the environment, which will cause a public nuisance in accordance with the Section 67 of the Public Health Act Cap 295 of the Laws of Zambia.

- Interruption of water supply during extension of water networks to new housing units in C6 and C7, will cause a shortage of water.

- Impact of reduction in the amount of water supplied to the district.

1.4 Mitigation Measures

- The time spent on removing and replacing the pumps and panels in the sewage pump stations should be as short as possible to reduce the risk of an outbreak of disease due to the sewage released into the environment during rehabilitation.

- During dredging, it should be ensured that the operators are protected from coming in contact with the silt from the dam to prevent them from contracting disease and also protection from deadly reptiles should be provided.

- Recommendation to involve the Environmental Council of Zambia in deciding on the disposal of the silt and weeds into the environment surrounding the ponds.

- Some form of compensation should be given to the people living in the buffer zone of the sewage ponds. Despite them settling illegally at that site, they have put up a solid structure which if demolished without any form of compensation would render them finished, in terms of their livelihood.

- Timely notification of the public and minimise the time spent on the works.
✓ Since there is not enough space for the silt, it is recommended that it is taken to the area around the ponds or drying beds at the sewage works

✓ Time spent in terms of interruption in the flow of sewage when extending sewerage to the new houses in C6 and C7, should be minimise to avoid causing a nuisance

✓ The time spent extension of water networks to new housing units in C6 and C7, should be minimised.

✓ In case of the sanitation demonstrations, attention should be paid to the siting of sanitation facilities (latrines) in relation to water supply in order not to contaminate the water.

✓ Sanitation facility maintenance (structural and cleanliness)

1.5 Benefits/Positive Impacts

✓ Replacements of sewage pump stations will improve on the pumping of sewage hence reduce on the cases of sewage overflowing to the environment and causing a nuisance.

✓ Dredging of the sewage ponds will render them safe for the people working at the sewage works and also increase on the capacity and effectiveness of the ponds. This will also help with reducing pollution to the Kafue river from the effluent being discharged in its raw state

✓ Moving or displacing the people living within the buffer zone will be beneficial in that they will be moved to health and safety.

✓ Dredging of ponds at Nangongwe ponds will increase on their capacity, hence reducing the chances of sewage flowing into the open drains

✓ Construction of sanitation will help improve the state of sanitation in peri urban areas such as the Zambia Compound

✓ Replacing of water pumps will contribute to the quantity of water in Kafue

✓ Rehabilitation of water treatment plant will improve the quality of water supplied to the Kafue residents

✓ Repair of leaking pipes will contribute to both the quantity and quality of water supplied to the consumers.

Despite the mentioned negative impacts to be encountered during the rehabilitation works, there is a possibility that the ideal situation after rehabilitations will reduce the number of communicable diseases associated with poor quality water and sanitation. The disease burden in Kafue over the period 2005 to 2007 are as shown below:
KAFUE: DISEASE BURDEN

<table>
<thead>
<tr>
<th>Disease</th>
<th>2005 Cases</th>
<th>2006 Cases</th>
<th>2007 Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilharzia (Schistosomiasis)</td>
<td>99</td>
<td>79</td>
<td>560</td>
</tr>
<tr>
<td>Diarrhoea: bloody (suspected Dyentery)</td>
<td>469</td>
<td>509</td>
<td>2,079</td>
</tr>
<tr>
<td>Diarrhoea: non-bloody</td>
<td>3,549</td>
<td>4,892</td>
<td>15,464</td>
</tr>
<tr>
<td>Diarrhoea with severe dehydration (suspected cholera)</td>
<td>-</td>
<td>482</td>
<td>31</td>
</tr>
<tr>
<td>Ear/Nose/Throat infections</td>
<td>1,780</td>
<td>1,724</td>
<td>7,175</td>
</tr>
<tr>
<td>Eye infections</td>
<td>1,300</td>
<td>1,453</td>
<td>4,680</td>
</tr>
<tr>
<td>Intestinal worms</td>
<td>953</td>
<td>807</td>
<td>3,490</td>
</tr>
<tr>
<td>Malaria</td>
<td>25,119</td>
<td>25,975</td>
<td>82,042</td>
</tr>
<tr>
<td>Skin infections</td>
<td>3,724</td>
<td>3,328</td>
<td>10,434</td>
</tr>
</tbody>
</table>

Adapted from the Disease Summary – Surveillance Office (Ministry of Health)

It should be noted that the above data, according to the Ministry of Health, covers both Kafue and Chilanga.

2.0 CHILANGA

2.1 Description of works

✓ Replacement and repairs to borehole pump equipment
✓ Chlorination dosing equipment
✓ Repairs to rising mains and distribution network
✓ Extension of network to additional 260 houses
✓ Provision of new 100m³ reservoir

2.2 Issues Raised/current situation

✓ Water intake comprising of two boreholes; one operational whilst the other is not it was left open after sinking
✓ Borehole re-equip will require shutting of water Estates
✓ Repair roof and install meter to ground reservoir
✓ Fence is not adequate to deter people from entering and it is not secured
✓ Youth make blocks and gardening within the pump station premises over-using water from the underground reservoir
✓ Pump house has cracks on the walls
✓ Need to replace pumps, only one is working
✓ Rehabilitation of water line leading to the reservoir; there is some construction works going on a plot adjacent to the pump house where the water line passes. The house being constructed is on slab level
✓ The line also cuts across a road
✓ The water reservoir needs repair, putting the meters and improve on the outlook through painting
✓ Minor pipe replacements in the existing line
✓ New installation of water lines to the new houses cutting the road coming into Chilanga. New borehole, depending on the yield, will supply to the new 260 houses
✓ In the Game and Fisheries area, water supply is a very big problem. Some households draw borehole water for drinking from a nearby church and for washing from the stream
✓ At the pump house, the LWSC provided a pump but was stolen due to lack of security, hence need to replace the pumps and secure the place
✓ Pipelines from the pump house to the reservoirs and the houses are dilapidated needing replacement
✓ The two (2) small reservoir are in a bad state; dilapidated with risk of foreign matter or creatures falling into the water
✓ New network to the houses and other facilities
✓ The reservoirs are within the proximity of a household

2.3 Impacts
✓ Interruption of water supply during the borehole re-equip
✓ Shutting down of water during the repair of the roof and installation of the meters to the ground reservoir
✓ The rehabilitation will impact on the youths' livelihood since it will call for them being moved from the premises to go and do their block making and gardening elsewhere
✓ Demolition of a slab for the house on a plot where part of the water network passes.
✓ Traffic diversion in places where the network cuts across the road
✓ Trenches posing as a breeding ground for disease vector such as mosquitoes and also pose a danger to the safety of the public in terms of accidents
✓ Noise in areas where blasting of rocks during excavation for new networks will be required
✓ Dust during excavation
✓ In the Game and Fisheries, during the rehabilitation of the two dilapidated reservoirs inconvenience will be caused to the household which is next to the facility

2.4 Mitigation Measures
✓ Timely notification of water interruption and minimising the time of rehabilitation
✓ The Youth Group to be given enough notice and help them find an alternative to their livelihood
✓ Consultations with the Local Council on the legality of the plot on which the slab has been constructed and establish whether compensation will be required
✓ To avoid commencing rehabilitation during the wet season
2.5 Benefits/Positive Impacts

- Opening of the non-operational borehole will contribute to the yield of water to be supplied to the new areas
- Re-equipping of the borehole will improve on the water quantities coming from the old borehole
- Provision of security to the pump station will prevent vandalism and theft
- Replacement of pumps will boost the water supplied to the area
- Rehabilitation of pipes and reservoir will improve water supply through the reduction of leaks in the existing pipes and reservoir
- The new installations will benefit the residents in the area which is not yet serviced

3.0 CHONGWE

3.1 Description of works

- De-silting of the Chongwe dam to increase on the water storage capacity
- Upgrade and securing of the existing building for the pump station
- Replacement of intake pumps to supply the treatment works
- Repair tank leaks, meters, and valves for Braithwaite tank
- Network rehabilitation, repair leaks and create districts
- Network extension (additional 5km mains) to unserved areas
- 5 sanitation demonstrations covering all types of sanitation (i.e. traditional pits; the pour flash; the VIP; the Eco-san; and the septic tank)
- Installation of the water treatment dosing equipment

3.2 Issues Raised/current situation

- The dam contains highly contaminated water draining from the Kaunda Square sewage ponds in Lusaka via Ngwerere stream
- The water in the dam is high in faecal coliform which is from the effluent.
- Chongwe residents use water from the dam to bath, wash, and cook and to clean utensils and not for drinking. The use of water from the dam for the above-mentioned purposes does not guarantee safety from diseases that are transmitted through the oral route because during the process some contaminants from the water may end up in the foodstuffs or oral route and cause disease.
- The area around the dam is currently used as maize fields by residents of Chongwe
- Sanitation demonstrations to be both adjacent to the Chongwe dam and 2 at the LWSC office, then later replicated to other parts of the settlements in the district, considering that there is a problem of sanitation and shortage of water.
✓ People to be consulted and to participate in the construction of the sanitation demonstrations

✓ In terms of sanitation, due to the shortage of water, there are standby pit latrines even in conventional housing units.

✓ In areas where there is use of septic tanks, there is a problem of emptying when they are full. The local council has no capacity to do so.

✓ Water is not effectively treated, i.e. it is just chlorinated directly using a perforated 20-litre plastic container which is placed on an open space on the side of the water reservoir. This is done with all the sediments in the water without either some form of sedimentation or filtration.

✓ There is a presence of silt in the water coming from the taps.

✓ There is turbidity in the water coming from the taps in homes that are closer to the pump station.

✓ Some networks that are to be rehabilitated pass through people’s plots

✓ There are people living very close to the dam (within the buffer zone)

✓ The water which is tapped from Chongwe dam which is meant for other uses other than drinking is paid for by the residents. Whereas, water meant for drinking which from the boreholes by use of hand pumps is free.

3.3 Impacts
✓ Health risk of contracting diseases from the highly contaminated silt if not properly handled during the de-silting or dredging process, depending on the methodology employed

✓ Impact of contaminating the soil around the dam

✓ Noise disturbances to the people living within the vicinity of the dam

✓ The use of the area currently used as maize fields for drying and disposing off the sludge/silt will affect the people’s domestic food security, hence contribute to malnutrition.

✓ Impact of water interruptions during the rehabilitation and extension of the water network

✓ Digging of trenches will be a health hazard when done during the rainy season; stagnation of water will lead to the breeding of mosquitoes

✓ Disturbances to the households where some parts of the networks pass

✓ Water washed diseases during interruption of water when the works are not done within the shortest possible time

3.4 Mitigation Measures
✓ During dredging, it should be ensured that the operators are protected from coming in contact with the silt from the dam to prevent them from contracting disease
✓ With the land around the dam, it should be ensured that the area is not used by the maize farmers until the area is rendered free from serious bacterial load and is fit for such purposes as planting maize.

✓ Consultations should be done with the Environmental Council of Zambia, in relation to the disposal of silt on the surrounding land. Ensure that samples of silt be tested to ascertain its safety to be dumped that land considering that people use it for maize growing.

✓ Timely public notification to the residents who are likely to be disturbed by noise during the dredging process and to ensure that the time spent on the works is limited bearing in mind the impacts it will cause if prolonged

✓ Timely notification to the residents who use the area around the dam for growing their maize, so as to ensure that they are not inconvenienced in terms of planning for their domestic food security

✓ Timely public notification of the water supply interruption

✓ For the replacement of pipes and the new networks, it should be ensured that works are done in the dry season and limit the time to be spent on the works

✓ To contain the disturbances that are to be caused on the owners of the households where the networks pass, timely notification should be ensured and the time to be spent on the works should be minimised

✓ To avoid outbreaks of water washed diseases during the rehabilitation period, timely notification should be done to ensure that residents store enough water for use during that period

3.5 Benefits/Positive Impacts

✓ The benefit of dredging the dam is bound to be greater than the impacts it will have, because it will increase the storage capacity of the dam, hence increasing on the water yield for the district.

✓ The silt when properly analysed and treated can help with conditioning and providing fertility to the land used for maize growing

✓ Despite the noise and other impacts which will be caused by the dredging, the benefit of having enough water for the district is much more than the short term impacts

✓ Replacement of defective networks will help lessen the issue of leaks and contamination of water during distribution

✓ New networks will be beneficial to the areas that are currently not receiving water supply

✓ Even if there could be problems with the temporal interruption of water supply during rehabilitation, the overall benefit of having safe (treated) and wholesome (enough) water outweighs any impacts that can be experienced.

✓ The construction of sanitation demonstrations will greatly benefit the residents of Chongwe considering that currently there is a problem with sanitation due to the shortage of water.
The installation of the water treatment dosing equipment will be beneficial in terms of the quality of water to be provided to the residents of Chongwe, considering that the treatment method being used currently is inadequate.

### CHONGWE: DISEASE BURDEN

<table>
<thead>
<tr>
<th>Disease</th>
<th>2005 Cases</th>
<th>2006 Cases</th>
<th>2007 Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilharzia (Schistosomiasis)</td>
<td>1,292</td>
<td>1,505</td>
<td>1,507</td>
</tr>
<tr>
<td>Diarrhoea: bloody (suspected Dysentery)</td>
<td>1,533</td>
<td>1,452</td>
<td>1,666</td>
</tr>
<tr>
<td>Diarrhoea: non-bloody</td>
<td>12,459</td>
<td>16,253</td>
<td>16,957</td>
</tr>
<tr>
<td>Diarrhoea with severe dehydration (suspected cholera)</td>
<td>2</td>
<td>41</td>
<td>18</td>
</tr>
<tr>
<td>Ear/Nose/Throat infections</td>
<td>5,371</td>
<td>7,997</td>
<td>7,218</td>
</tr>
<tr>
<td>Eye infections</td>
<td>6,213</td>
<td>8,163</td>
<td>7,006</td>
</tr>
<tr>
<td>Intestinal worms</td>
<td>3,128</td>
<td>3,406</td>
<td>3,491</td>
</tr>
<tr>
<td>Malaria</td>
<td>89,105</td>
<td>103,636</td>
<td>70,773</td>
</tr>
<tr>
<td>Skin infections</td>
<td>10,704</td>
<td>12,229</td>
<td>11,010</td>
</tr>
</tbody>
</table>

Adapted from the Disease Summary – Surveillance Office (Ministry of Health)

### 4.0 LUANGWA

### 4.1 Description of works
- Replace intake main, provide standby pump and upgrade high lift pumps
- Refurbish treatment plant and provide chemical dosing equipment
- Repair two reservoir tanks and fit with valves and meters
- Rehabilitate the water network, and reinforce at road crossings
- Extend the water network and provide water meters
- Decommission salty wells and link consumers to pipe work
- Sanitation demonstrations – pilots

### 4.2 Issues Raised/current situation
- There is one pump at the intake, hence the need to install a standby pump
- The rising main needs to be replaced up to the tank (reservoir) in order to improve on the flow of water up to the tank. There are some households besides the pipeline which needs replacing
- The filters and sedimentation tanks are not working effectively. There was evidence of algae in the tanks and the water was not undergoing sedimentation i.e. particles with algae were instead floating in the water.
- Reservoir No. 2 was not in used. It needs to be repaired
- In Soweto compound and Kamoba ‘B’ communities use the salty water coming from a borehole. The tank at this borehole is corroded due to the said salt which is contained in
the water. There was also a complaint of a bitter taste in the water as well as wearing out clothes quickly. Stomach aches were also a general complaint from the people living in this area.

✓ There was also a complaint of plants withering due to the usage of the salty water to water the gardens, hence no gardening is done in this area. There was also an evidence of stained teeth which was also confirmed with the nurses at the Katondwe Mission Hospital as the main evident condition in people coming from the area.

✓ Only two communal taps servicing a population of about 700 – 1000 people, which leads to fights for water at taps.

✓ Residents pay a sum of K3, 500 for the salty water coming from the borehole and K500 for the maintenance of the borehole.

✓ Due to the state of the water residents are taking currently, they requested that the LWSC extends the water service provision to the area, in order for them to stop drinking salty water.

✓ Sanitation facilities provided in Luangwa are mainly the traditional pit latrines, a few on Ventilated pit latrines (VIPs) built with assistance from CCF, and very few people are on septic tanks.

4.3 Impacts
✓ Water interruptions during replacement/rehabilitation of the rising mains, repair of the treatment plant as well as the reservoir

✓ Trenches posing as a breeding ground for disease vector such as mosquitoes and also pose a danger to the public in terms of accidents

✓ Interruption of water supply to the affected people around the borehole with salty water

4.4 Mitigation Measures
✓ Timely notification of water interruption and minimising the time spent on rehabilitation

✓ To commence rehabilitation and installation works during the dry season

✓ Decommissioning of the borehole which has salty water should be done after connecting the affected community to the mains

4.5 Benefits/Positive impacts
✓ Since there is only one pump at the intake, installing a standby pump will benefit the Luangwa residents in that there is going to be a backup in of one developing a fault.

✓ The replacement or rehabilitation of the rising main up to the tank (reservoir) will improve on the flow of water up to the tank.

✓ Refurbishing of the filters and sedimentation tanks help will contribute in the improvement of water treatment.

✓ Repairing Reservoir No. 2 will increased on the water storage capacity

✓ Decommissioning of the borehole servicing Soweto compound and Kamoba ‘B’ communities which contains salty water will prevent people from drinking/using water which is not wholesome.
Repairing of the tank which is corroded due to the storage of salt water will help with providing a sound storage tank for the fresh and wholesome water.

When provided with wholesome water, residents in this area will be able to have backyard gardens for their domestic food security.

Provision of sanitation facilities for the residents will improve the sanitation situation from the use of traditional pit latrines to more appropriate forms of sanitation that do not need a lot of water.

### LUANGWA: DISEASE BURDEN

<table>
<thead>
<tr>
<th>Disease</th>
<th>2005 Cases</th>
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<th>2007 Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilharzia (Schistosomiasis)</td>
<td>216</td>
<td>205</td>
<td>227</td>
</tr>
<tr>
<td>Diarrhoea: bloody (suspected Dysentery)</td>
<td>471</td>
<td>515</td>
<td>492</td>
</tr>
<tr>
<td>Diarrhoea: non-bloody</td>
<td>3,010</td>
<td>2,946</td>
<td>3,130</td>
</tr>
<tr>
<td>Diarrhoea with severe dehydration (suspected cholera)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ear/Nose/Throat infections</td>
<td>899</td>
<td>920</td>
<td>913</td>
</tr>
<tr>
<td>Eye infections</td>
<td>2,024</td>
<td>2,213</td>
<td>1,978</td>
</tr>
<tr>
<td>Intestinal worms</td>
<td>213</td>
<td>326</td>
<td>275</td>
</tr>
<tr>
<td>Malaria</td>
<td>15,86</td>
<td>18,572</td>
<td>23,102</td>
</tr>
<tr>
<td>Skin infections</td>
<td>2,482</td>
<td>2,534</td>
<td>2,251</td>
</tr>
</tbody>
</table>

Adapted from the Disease Summary – Surveillance Office (Ministry of Health)

In all the above places visited and the issues raised, it is concluded that despite the several negative impact observed, discussed and raised, the benefits or positive impacts of the rehabilitation/improvements to the water and sanitation facilities, outweighs the negative impacts. Hence rehabilitation works are inevitable.

Going by the disease burden for the districts shown above, it is noted that the above communicable diseases could be caused by the use of either insufficient or poor quality water, therefore, it is not advisable to adopt the “no action” option because rehabilitation works will improve the general health of the people in Kafue, Chongwe and Luangwa.
<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Person(s) talked to</th>
</tr>
</thead>
<tbody>
<tr>
<td>13/06/08</td>
<td>Lusaka Water and Sewerage Company</td>
<td>Mr Ngenda David (LWSC)</td>
</tr>
<tr>
<td>16/06/08</td>
<td>LWSC</td>
<td>Jilly Chiyombwe and Hebert Chinokoro (LWSC)</td>
</tr>
<tr>
<td>17/06/08</td>
<td>Chongwe</td>
<td>Mr Michael Chileshe (LWSC)</td>
</tr>
<tr>
<td>18/06/08</td>
<td>Kafue</td>
<td>Edward (LWSC-Sanitation Engineer)</td>
</tr>
<tr>
<td>19/06/08</td>
<td>Chilanga</td>
<td>Mr Nyirenda – Chairman Ward DC</td>
</tr>
<tr>
<td>20/06/08</td>
<td>Chongwe District Council</td>
<td>Mr Nasilele F.M – Deputy Council Secretary</td>
</tr>
<tr>
<td>25/06/08</td>
<td>Nangongwe Health Centre, Estates Clinic, Kafue Universal Steel Company</td>
<td>Sister Stella Bowa-Sister-In-Charge, Sister Ng’andu-Sister-In-Charge, Mr Ayub Adams</td>
</tr>
<tr>
<td>26/06/08</td>
<td>Luangwa</td>
<td>Mr Michael Chileshe &amp; (LWSC)</td>
</tr>
<tr>
<td>27/06/08</td>
<td>Luangwa (Soweto Compound)</td>
<td>Soweto compound Residents</td>
</tr>
<tr>
<td>28/06/08</td>
<td>Chongwe (Health Centre)</td>
<td>District Health Inspector</td>
</tr>
<tr>
<td>30/06/08</td>
<td>Kafue - Universal Steel Company</td>
<td>Dr Julius Kaoma - Director</td>
</tr>
<tr>
<td>01/07/08</td>
<td>Lusaka Water and Sewerage Company – Libala Water Works</td>
<td>Mr Gabriel Chikama – Manager, Water Quality Assurance</td>
</tr>
</tbody>
</table>
APPENDIX E: COMPENSATION POLICY/ RESETTLEMENT FRAMEWORK
APPENDIX F: REVIEW OF HYDROGEOLOGICAL DATA

Introduction
This review builds on the previous report that was prepared as part of the ESIA for original project regards rehabilitation of water supply and sanitation services in the City of Lusaka.

The objective of the review is to extend the assessment to also cover groundwater potentials for the district towns of Chilanga near Kafue and Chongwe located about 45 km directly east of Lusaka. Existing groundwater development in these areas can be summarized as follows.

Chilanga: The area is divided into two separately managed sub-areas/ compounds, Estates and Game and Fisheries, which both depend on groundwater from the underlying Lusaka limestone and dolomite formations. Of the 5 installed wells (i.e. two in Estates and three in Game and Fisheries) only one well in the Estates area is operational. During the site visit this yield appeared to be good, on the order of 20-30 l/sec and the water was clear. Consider the short distance it is thought that yield and water quality from the remaining boreholes should also be acceptable. To strengthen and increase water supply one is looking at rehabilitating or possible re-installing these boreholes.

Chongwe: The area currently depend on boreholes for drinking water and surface water from the Chongwe dam for other domestic uses. There are several boreholes in the area, and most of these are equipped with hand pumps. Yields are reported to be low, on the order of less than 0.5 l/ sec on average. Because the Chongwe river is heavily impacted by sanitary drainage from Lusaka sewage treatment works and consequently polluted, groundwater is regarded as the main source to increase safe drinking water supply for the immediate future. As part of the current project one therefore plans to install at least 4 new boreholes.

Sources
The review is based on the following maps and borehole logs provided by the Groundwater section of the Department of Water Affairs in Lusaka. Figure 1 below shows an aerial overview of the areas of interest with the bore locations superimposed. Excerpts of the respective geological maps and bore logs are provided in Figures 2 through 7.

Chilanga Area (15° 33' 58.47" S; 28° 16' 08.64 E – 15° 33' 21.08" S, 28° 16' 40.28" E)
- Geology of the Lusaka Plateau, 1:250 000, Groundwater Section, Dept. of Water Affairs
- Excerpt of Geological Map of the Lusaka Area 1:100 000 with borehole locations, Groundwater Section, Dept. of Water Affairs
- Borehole logs U-1B and Unda Unda Palace

Chongwe Area (15° 19' 02.29" S, 28° 40' 55.59" E – 15° 18' 44.21" S, 28° 41' 17.67" E)
- Borehole logs Chinikuli P Sch and Chanyanya Harbour
Figure 2. Geology of the Chilanga area (dashed circle shows the area of interest)

Figure 3. Chanyanya Harbour Lithology

Figure 4. U-1B Lithology
Figure 5. Geology of the Chongwe area (dashed circle shows the area of interest).

Figure 6. Chinikuli P Sch Lithology

Figure 7. Unda Unda Palace Lithology
Assessment

Viewing the above figures the geology in the Chilanga and Chongwe areas south and east of Lusaka respectively mainly consist of limestone bounded by the less permeable schists of the Chunga formation (i.e. Chilanga) and the transition zone crystalline meta-sedimentary rocks of varying metamorphic grade (i.e. Chongwe). Groundwater occurrence is in both instances confined along fractures where dissolution in combination with tectonic activity has concentrated drainage and increased the permeability and porosity (i.e. storage potential) of the host rock. Dissolution enlargement or karstification consequently explains the significantly higher permeability and yield in the carbonate rocks compared to the surrounding crystalline and metamorphic rocks.

Implications for groundwater development are the greater number of bores and effort required in striking exploitable quantities at depth in the latter crystalline formations (e.g. Chongwe) compared to the limestone where reasonable success is almost a given.

Recommendations

To minimize the costs with re-developing existing sources (e.g. Chilanga) as well as exploration and installation of new ones (e.g. Chongwe) the following set of guidelines are suggested.

Chilanga: Existing wells should be tested using calliper/ down-the hole log to ensure the structural integrity of the screen, casing and grouting. Once the latter has been established the well should be re-developed using air flushing and then disinfected with chlorine. A pumping test should then be conducted to determine yield, pumping rate and choice of pump.

Chongwe: In hard rock terrains where groundwater potentials may vary significantly and often are marginal detailed knowledge of geology is emphasised. To locate fracture/ weathering zones at depth an initial mapping of lineaments using aerial imagery should first be conducted. By superimposing the mapped features on existing geological maps greater insight to the tectonic behaviour and development of permeability can be obtained. Boreholes can thus be positioned to strike inferred weathering and or fracture zones at depth. To increase the confidence in the predictions electrical resistivity may be employed, and used in combination with groundwater modelling software to visualize and analyses the data in 3-D, this is often the preferred method to site boreholes and a groundwater abstraction scheme for a larger area.

At Chongwe it has been suggested that 4 new boreholes should be drilled relatively close to the existing well near the water works at the Chongwe dam, the reason being that the existing water quality and yield at this location is reported to be acceptable. Although such a strategy seems sensible, it is important to keep in mind that if all 4 boreholes tap into the same weathering horizon or fracture plane individual yields may decrease. As a minimum it is therefore recommended that an assessment using aerial imagery (preferably air photos) be conducted to identify lineaments.