ZAMBIA PRIVATISATION AGENCY
ZAMBIA RAILWAYS PRIVATE SECTOR PARTICIPATION PROJECT

ZAMBIA RAILWAYS ENVIRONMENTAL ASSESSMENT STUDY
FINAL REPORT

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EXECUTIVE SUMMARY

In July 1998, the Cabinet of the Government of the Republic of Zambia (GRZ) directed that Zambia Railways be studied for the exploration of the possibility of entering into concessions for some operations and consultants have recommended certain modes of concessioning. A concessioning process is proposed which will probably lead to the operations of ZRL being concessioned during the year 2000. To that end, several consultancy studies have been commissioned. The environmental assessment study is one of them.

The purpose of the environmental assessment study was to examine the environmental conditions, the legislative and regulatory frameworks and determine the need for clean-up and other remedial measures as well as to review the institutional capacities for compliance and enforcement of environment and safety-related issues. The assessment and audit exercise focused on solid waste discharges, hazardous waste discharges/materials; and occupational health and safety issues. The scope of the work encompassed investigations, information collection, interviews, document reviews and detailed assessments of environmental impacts that may have been caused by ZRL. The assessment exercise also took cognisance of the fact that the project had to comply with the World Bank’s ten environmental and social safeguard policies. Remediation measures were also identified. The following were the major conclusions:

(a) Mandatory Matters

- ZRL has a fairly elaborate company policy(with associated rules and procedures) for safety and health at work. The company, however, has no site specific safety and occupational health plans. Furthermore, adequate and appropriate protective equipment, clothing and accessories are in short supply. Safety and occupational health training is not regularly availed to all employees. Occupational health matters are stipulated in the Factories Act.
- Liquid waste discharges mainly consist of oil-water/oil-washings admixtures. Small percentages of acid and caustic soda also find their way into drains. The oily discharges are freely discharged into unauthorised areas adjacent to the workshops. The situation is very unsatisfactory. The Environmental Council of Zambia has an important role to play here.
- There is no air pollution monitoring program
- The environmental impacts of ZRL’s track weed control program(chemical spray) and the use of wooden sleepers are unknown. This is unsatisfactory.
- Under existing environmental legislation in Zambia, responsibility for clean up lies squarely with ZRL(“Polluter Pays Principle”).

(a) Recommended Practice
• ZRL has neither an environmental policy nor an environmental management system. There is, however, growing interest at ZRL to formulate an environmental policy. It is commendable to note that ZRL has a safety and environment department headed by a manager. The environment function was added to the department just over a year ago. The environment agenda is therefore relatively new at ZRL.

• ZRL is an enterprise in serious need of both technical and managerial know-how in order to improve environmental management and performance. There is inadequate environmental knowledge and skills generally. There is also inadequate knowledge of relevant pieces of legislation and regulations; and compliance requirements. ZRL does not have any environmental permits obtainable under the Environmental Protection and Pollution Control Act. Environmental checking and corrective actions are also non-existent. This report provides a sound basis for better information and compliance.

• Significant amounts of hazardous wastes are generated by ZRL. These include fuel and lubricant oil wastes/admixtures, furnace heavy metal slug and wastewaters entrained with caustic soda. The handling and disposal of hazardous materials does not conform to cleaner production practices. The SADC hazardous materials handbook and the ISO 14000 series of standards are useful sources for remedial action.

• The arrangements for solid waste collection and disposal are haphazard. The major solid waste categories include scrap metal, furnace slag, machine shop swarf, saw dust and waste coke.

• There is a serious environmental, occupational health and safety problem associated with copper concentrate droppings at Kitwe, other Copperbelt stations and on the Copperbelt lines generally. The copper droppings dust is an occupational health hazard particularly to shunting staff. The droppings are also extremely corrosive to the rails and the state and integrity of the railway system at these stations have been severely affected. All the parties involved must find a lasting solution.

• The potential health hazards at the workshops include paint fumes, fine metal dusts and noise. The hazards associated with copper concentrate handling/loading and mine-related environment pollution on Zambia’s Copperbelt also need mention.

(b) Compliance by Others

• ZRL handles huge quantities of petroleum fuel and lubricant oils. Storage tanks are a mixture of above ground and underground tanks. Permits exist for storage tanks although the responsibility for the integrity and safety of the tanks lies with the petroleum and gas companies themselves. There is no formal self inspection program for storage facilities and the storage areas are not always properly identified by posters. The Petroleum Act and the Environmental Protection and Pollution control Acts must be complied with.

• The company has no environmental emergency preparedness and response plan. This is highly unsatisfactory and can lead to prosecution and remediation costs associated with contingent environmental damages caused by transported goods, for example.

• The Environmental Council of Zambia (ECZ) and its inspectorates are still very much in their infancy. Zambia’s supreme environmental legislation, the Environmental
Protection and Pollution Control Act was enacted in 1990. Setting up the ECZ took some years after that and the putting in place of regulations is still in progress. There are currently no established environmental monitoring programs even for non-contingent environmental damages. The capacity of ECZ to monitor contingent environmental damages needs to be augmented.

(c) Monitoring for Good Practice

- The quality of the borehole water at the central workshops is not regularly monitored

A costed action plan with the following elements has been developed. In the plan, it is assumed that the current ZRL will cease to be in its present form within the next 12 months or so and that thereafter a concessionaire will take over. The responsibilities are therefore tentatively spread between the current ZRL management and the concessionaire as follows:

(a) Concessionaire

- Development of an environmental policy and implementation of an environmental management system (EMS)
- It is recommended that an environmental audit be done every five years
- Development and introduction of cleaner production practices
- Installation, operation and maintenance of pollution control equipment and adoption of better methods of final disposal of hazardous wastes – some short-term measures may be implemented by ZRL
- Development and implementation of a solid waste collection and disposal system
- Training of safety and environment inspectors in matters related to storage facilities – ZRL could also take some short-term measures
- Introduction of a wastewater treatment plant operation and maintenance program and effluent monitoring program
- Introduction of an air pollution monitoring program
- Development and implementation of site-specific environment, health and safety plans
- Acquisition and provision of appropriate safety attire and accessories for staff – ZRL could also take some measures in the interim
- Competence and awareness safety and environment training for all staff – ZRL could also take some deliberate measures in the interim
- Establishment of management review procedures (as part of EMS)
- Development and implementation of environmental preparedness and response plans particularly with respect to transported goods
- Miscellaneous programs/studies including environmental impact assessments of track weed control program, use of wooden sleepers, etc.
(b) ZRL management

- Clean up of contaminated sites – including workshop premises, unauthorised disposal areas and some Copperbelt stations contaminated with copper concentrate droppings
- Also the issues identified above as joint responsibilities

In order to address the above issues in the above manner, the expected cost of actions assigned to ZRL and to be done by March 2001 is approximately US$200 000 as detailed in the Action Plan.

The major liability issues include:

- Operations without environmental permits or licenses on water, wastes, etc
- Lack of monitoring of pollutants released at various facilities
- Disposal of admixtures of waste oil, acids, caustic soda, etc into unauthorized areas and without pretreatment
- Lack of environmental preparedness and response plans
- Environmental, Occupational health and safety liabilities arising out of copper concentrate droppings on the Copperbelt

The conclusions and plans have been arrived at after taking full cognizance of the fact that environmental policies, legislation, institutions and debate are still in their infancy in Zambia but that there is, nonetheless, need to take corrective actions now.
1. INTRODUCTION

1.1 Background

In July 1998, the Cabinet of the Government of the Republic of Zambia (GRZ) directed that Zambia Railways Limited (ZRL) be studied for the exploration of the possibility of entering into concessions for some operations and consultants have recommended certain modes of concessioning. A concessioning process is proposed which will probably lead to the operations of ZRL being concessioned during the year 2000. To this end several consultancy studies have been commissioned. The environmental assessment study is one of them.

Currently, the responsibility for safety and environment-related regulation for ZRL is exercised by ZRL itself, in a rather informal manner. GRZ’s strategy aims to establish a more satisfactory arrangement to enforce technical, economic, safety and environmental regulations more effectively in view of the fact that the ZRL is a source of pollution and other environmental problems.

1.2 Purpose of the Environmental Assessment

The need has therefore arisen to carry out an environmental assessment incorporating an audit (snap shot of compliance, indication of potential liability) before undertaking concessioning, to examine the environmental conditions, the legislative and regulatory frameworks and determine the need for clean-up, and other remedial measures as well as to review institutional capacities for compliance and enforcement of environment and safety-related issues. The environmental assessment also addresses the need for the project to comply with the World Bank’s ten environmental and social safeguard policies and the relevant International and Regional Conventions ratified by Zambia.

1.3 Objectives, Scope and Methodology of the Environmental Assessment

The specific objectives and scope of the assessment were as follows:

- To evaluate the existing conditions of ZRL against national and international standards to determine the need for remedial actions necessary to bring the enterprise into compliance prior to concessioning;
- To evaluate current practices at ZRL, against national and international standards of environmental degradation to determine the need for action and investment prior to or subsequent to concessioning to reach those operational standards;
- To measure the environmental conditions of the enterprise against the risk of being held responsible for damages and degradation of the environment after concessioning;
- To use the audit findings to assess the environmental health and safety issues and provide information necessary for internal planning before and during concessioning and for planning;
To develop an action plan, which will serve as a basis for assigning clean-up responsibilities both prior and post-concessioning as well as for determining the future responsibilities of the public enterprise and the new private investor(s).

The scope of the work encompassed investigations, information collection, interviews, document reviews and detailed assessments of the environmental impacts that may have been caused by ZRL and identification of remediation measures. The facilities inspected included Kabwe Workshops and ancillary facilities; and Kafue, Kitwe, Kabwe and Lusaka Stations and environs.

The assessment focused on solid waste discharges, hazardous waste discharges/materials; and occupational health and safety issues. The audit considered both environmental management and environmental performance aspects in investigating the integrity of systems and procedures currently in place at ZRL.

1.4 Definitions

For the purposes of the study, the following definitions were adopted:

(a) Environmental Audit: A systematic, documented, periodic, and objective review of facility operations and practice related to environmental requirements

(b) Hazardous Waste (UNEP, 1985): Wastes (solids, liquids, sludges, containerised gases) other than radioactive and infectious wastes which by reason of their chemical activity or toxic, explosive or other characteristic cause danger or likely will cause danger to health and environment whether alone or when coming into contact with other wastes

(c) Solid Waste: Those wastes other than liquids or gases which are deemed by their owner to no longer possess value and are thus discarded

(d) Occupational Health and Safety: The practice of how to keep good health and prevent the spread of disease at work (industrial hygiene/occupational health(e.g. fumes, noise, temp)); and the state of mind by which employees are made constantly aware of the possibilities of accident or injury at all times (safety).

2. LEGISLATIVE AND REGULATORY FRAMEWORK

Presently there are about 30 pieces of legislation pertaining to the environment in Zambia. These include:

(a) The Environmental Protection and Pollution Control Act (1990)

Passed in 1990, this is the principal Act on environment in Zambia. The Act provides for the establishment of an Environmental Council whose main functions constitute the protection of the environment and control of pollution in particular so as to provide for the health and welfare of persons, animals, plants and the environment in general.

(b) The Natural Resources Conservation Act (1970)
Enacted in 1970, the Act provides for the establishment of the Natural Resources Advisory Board whose main functions are to ensure the proper use, conservation and improvement of natural resources. Some of the provisions of the Act have since been repealed with the coming into force of the EPPCA. This includes the abolition of the Natural Resources Advisory Board.

(c) The Town and Country Planning Act (1962)

The Act came into force in 1962 and provides for the appointment of planning authorities whose main responsibilities are the preparation, approval and revocation of development plans. It also provides for the control of development and subdivision of land. The Act does not however apply to trust land and land in Reserve and Mining Areas which fall under regional plans.

(d) The Water Act (1949)

The Act came into force in 1949 and provides for the control, ownership and use of water excluding that of the Zambezi, Luapula and Luangwa Rivers which form borders with other countries. The Act establishes the Water Board and regulates the use of public water including protection against pollution.

(e) The Fisheries Act (1974)

Enacted in 1974, the Act provides for the development of commercial fishing, control of fishing and registration of fishermen and boats.


Passed in 1991, the Act provides for the establishment, control and management of National Parks; conservation and protection of wildlife and objects of interest in National Parks; the establishment of Game Management Areas; the licensing of hunting; control of possession of trophies and control of bush fires.

(g) The Public Health Act (1930)

Passed in 1930, the Act has been amended from time to time. The Act provides for prevention and suppression of diseases and general regulation of all matters connected with public health in the country.

(h) The Local Government Act (1991)

The Act came into force in 1991 and provides for the establishment of Councils in districts, the functions of local authorities and the local government system. Some of these functions relate to pollution control and protection of the environment in general.
(i) The Local Administration (Trade Effluent) Regulations (Statutory Instrument No. 161 of 1985)

The regulations provide for the control of medical, trade and industrial effluent disposal.

(j) Ionising Radiation Act (1975)

Passed in 1975, the Act provides for the protection of public workers from dangers arising from the use of devices or materials capable of producing ionising radiation.

(k) Mines and Minerals Act

Originally passed in 1976, the Act provides for the granting of, renewal and termination of mining rights. It also provides for the control of mining activities with regard to environmental protection.

(l) Agricultural Lands Act (1960)

The Act was passed in 1960 and provides for the protection and alienation of land for agricultural purposes only.

(m) The Factories Act (1967)

Enacted in 1967, the Act regulates the conditions of employment in factories and other places of work as regards the safety, health and welfare of persons employed there in. The Act also provides for the examination and inspection of certain of certain plant and machinery in order to ensure safety.

(n) The Investment Act (1993)

Passed in 1993, the Act provides a legal framework for investment in Zambia. The Act relates to environment indirectly by providing incentives for tree planting, soil and water conservation activities. The Act further recognises the role of sectoral agencies including those responsible for environmental protection in authorising specific projects.

(o) The Tourism Act

Enacted in 1979, and amended in 1985, the Act provides for the control of tourism enterprises. The Act though making no direct reference to environmental protection does provide for appeals against authorisation of tourism projects which are deemed to negatively affect Zambian tourism which is basically natural resource based.

The Act provides for the alienation, transfer, disposition and charge of land. Although the Act does not refer to matters of conservation, it is important in that land is one of the basic natural resources.

(q) The National Heritage Conservation Commission Act

Enacted in 1989, the Act provides for the conservation of ancient, cultural and natural heritage, relics and other objects of aesthetic, historical, pre-historical, archaeological or scientific interest.

(r) Noxious Weeds Act

Enacted in 1953, the Act provides for the declaration and eradication of noxious weeds.

(s) International Game Park and Wildlife Act

The Act was enacted in 1971 to provide for the establishment of International Game Parks.

(t) The Agriculture, (Fertilisers and Feeds) Act (1990)

The Act became effective in 1990 and provides for the regulation and control of the manufacture, processing, importation and sale of fertilisers and feeds. It also provides for ensuring minimum standards of effectiveness of fertilisers and feeds.

(u) Plumage Birds Protection Act (1915)

Passed in 1915, the Act prohibits dealing in plumage of wild birds except for scientific or educational purposes.


Enacted in 1974, the Act repealed the Forest Act (Cap 311) of the Laws of Zambia. It provides for the establishment and management of national and local forests, conservation and protection of forests and trees, and licencing and sale of forest products.

(w) The Petroleum (Exploration and Production) Act (1985)

The Act was enacted in 1985 to regulate the exploration, development and production of petroleum products in Zambia.

(x) The Petroleum Act (1924)

The Act came into force in 1924 and provides for the regulation of the importation, conveyance and storage of petroleum and other inflammable oils and liquids for the protection of the public and the environment.
(y) The Explosives Act

The Act came into force in 1974 and provides for the regulation of the manufacture, use, possession, storage, importation and destruction of explosives. It also provides for the abandonment of explosive factories as well as the discharge of effluent from any treatment process involving explosives.

(z) The Zambezi River Authority Act

Signed in 1987, the Act provides for the interstate agreement between Zambia and Zimbabwe relating to the utilisation of the Zambezi River

(aa) International and Regional Conventions

Zambia is party to a number of international and regional conventions that address common environmental concerns. These include the Convention Concerning the Protection of Workers against Occupational Hazards in the Working Environment due to Air and Noise and Vibration.

The major relevant Acts for ZRL, therefore are the Environmental Protection and Pollution Control Act (EPPCA), the Factories Act, the Petroleum Act, the Public Health Act and the Local Government Act. The relevant subsidiary regulations under the EPPCA are as follows:

- Pesticides and Toxic Substances Regulations (1994)
- Water Pollution Control (Effluent and Wastewater) Regulations (1993)
- Waste Management (Transporters and Waste Disposal Sites) (1993)
- Air Pollution (Licencing and Emission Standards) Regulations (1996)
- Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations (1997)

Hazardous waste regulations are still in draft form. The regulations basically seek to categorise wastes into classes and to provide for means of handling, storage, pretreatment, transportation and disposal. ZRL will have to take steps to comply with the above pieces of legislation and regulations.

3. ZAMBIA RAILWAYS – COMPANY DESCRIPTION

3.1 Historical Background

What is now Zambia Railways Limited was formerly the North-Western Region of Rhodesia Railways with its regional headquarters at Kabwe while the company's headquarters was in Bulawayo (Southern Rhodesia then). The construction of the railway line started at Victoria Falls Bridge in 1903 and was finally connected to what is now Congo – DR in 1909.

In 1967, the Zambian government passed the Zambia Railways Act, which gave birth to the Zambia Railways Board. In 1978, the government decided that Zambia Railways should transfer to Zambia Industrial and Mining
Zambia Railways Environmental Assessment Study

Corporation (ZIMCO) with effect from January, 1979. This transfer necessitated the incorporation of a new company, limited by shares and the dissolution of the Zambia Railways Board.

In 1982, the Railways Act vested all assets and liabilities of Zambia Railways Board into Zambia Railways Limited, a company incorporated under the companies Act of Zambia. The transfer provided autonomy to the company to determine its own tariffs.

3.2 Mission

The mission of the company is to provide an efficient and effective freight and passenger rail service operated on commercial principles.

3.3 The Organisation

Zambia Railways extends from Livingstone to Kitwe with branch lines on the Copperbelt to serve all towns. At Choma, the line is linked to Maamba Collieries through the Masuku line. Livingstone links with Mulobezi, the source of Mukwa Timber. Zambia Railways links the country with those in the south at Victoria Falls Bridge; with the Democratic Republic of Congo at Sakania Border and with Tanzania via TAZARA at new Kapiri Mposhi (see map).

3.3.1 Management Structure

ZRL has a board of directors and the chief executive is the Managing Director. The Managing Director is supported by 4 directors namely, Director of Human Resources, Director of Technical Services, Director of Finance; and Director of Traffic and Marketing. The directors are supported by line managers, engineers, supervisors, superintendents, etc.

The Safety and Environment Manager falls under the Directorate of Human Resources. The Kabwe Central Workshops are headed by a manager who reports to the Director of Technical Services. She is supported by 3 engineers (Engineer, Motive Power; Engineer, Production and Maintenance; and Engineer, Carriage and Wagons).

3.3.2 Freight Services and Rolling Stock

Zambia Railways has at its disposal various types of wagons and has designed and continues to design various types of train services to meet customer needs. ZRL has about 6000 wagons. Current optimum usage is about 2500. 300 are scrap. The company also owns guard vans, bull dozers, wheel carriers, rail wagons and passenger coaches.

(i) General Purpose Wagons

Zambia Railways has a fleet of wagons suitable for both bulk and packaged products. These wagons range from high and drop sided
opens to bottom off loading hoppers and have the capacity to carry loads of between 39 and 52 metric tonnes.

(ii) Covered wagons

These wagons are used for carrying packaged products such as sugar, salt, flour, cement and rice.

(iii) Containers

Products transported in containers include motor cars, machinery and spare parts, cotton yarn, tea and electrical appliances. Zambia Railways has a fleet of flat wagons for the transportation of products in containers. Containers are usually used for the transportation of goods across international borders.

(iv) Tank Wagons

These are used for the conveyance of bulk liquids such as petrol, aviation fuel, sulphuric acid and molasses

(v) Livestock Wagons

These are used for the transportation of livestock such as cattle, goats, sheep and horses

Some clients who deal in large volumes of traffic have acquired their own rolling stock and constructed private sidings – that is, lines laid out to serve a factory, industrial or agricultural concern under a special agreement.

3.3.3 Key Statistics

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<td>Gauge</td>
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<tr>
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<tr>
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<td>Number of goods stations</td>
<td>20</td>
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<tr>
<td>Number of private sidings</td>
<td>205</td>
</tr>
<tr>
<td>Number of Marshalling Yards</td>
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</table>

3.3.4 Track Data

(a) Rails

(i) Main Line

- 80lb/yard between Bowwood and Victoria Falls Bridge
- 90lb/yard or reconditioned 80lb/yard between Bowwood and mookamungu
- 91lb/yard between Mookamungu and Ndola

(ii) Branch Line
60lb/yard on Livingstone/Mulobezi Line
- 80lb/yard on Choma- Masuku Line
- 80lb/yard on all Copperbelt Branch Lines

(b) Sleepers
(i) Main Line
- Prestressed concrete sleepers laid at 700mm spacing (1429 sleepers per Km) for a distance of 132 km between Bowwood and Mookamunga
- The rest is hardwood sleepers

(ii) Branch Lines
- Mulobezi/Livingstone branch line distance of 163 Km is laid on steel sleepers
- Choma-Masuku branchline on steel sleepers
- Copperbelt branch line on steel sleepers

(c) Stone Ballast
Rushed Granite, 40-50mm in size and applied as follows, in cubic metres/km:

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<th>Material</th>
<th>Straight Track</th>
<th>Curved Track</th>
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<tr>
<td>Steel</td>
<td>870</td>
<td>1000</td>
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<td>Wooden</td>
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<td>1400</td>
</tr>
<tr>
<td>Concrete</td>
<td>1385</td>
<td>1530</td>
</tr>
</tbody>
</table>

(d) Turnouts
Mainline 1 in 12 and 1 in 9
Branch Lines 1 in 9
Marshalling Yard 1 in 8

(e) Gradients
Main Line 1 in 80
Branch Lines 1 in 80

The main line upgrading now in progress involves replacement of wooden sleepers with pre-stressed concrete sleepers, the reconditioning of the 80lb/yard rails and converting them into long-welded panels between Simwani and Bowwood. There is also a re-sleepering programme being undertaken between Mookamunga and Ndola involving the replacement of wooden sleepers with concrete. Replacement of 80lb/yard rails on the main line and the 60lb/yard rails on branch lines with 90lb/yard and 80lb/yard respectively.

3.3.5 Signalling and Telecommunications
The main line between Livingstone and Kitwe is controlled by means of a modern microprocessor-based Centralised Trains Control (CTC) system from a control centre in Kabwe.

3.3.6 Motive Power

The company owns 59 main line and 12 branch line/shunting diesel electric locomotives of 2150 hp and 1650 hp rating respectively. It hires and operates locomotives varying in number between 15 and 30. Of the total number of locomotives about 45 are active.

3.3.7 Workshops

The central workshops at Kabwe are reasonably equipped with general and specialist equipment for carrying out heavy repairs and overhauls of rolling stocks. It also carries out wagon assembly works. Minor and running repairs are done at line points.

4. ENVIRONMENTAL PROFILE OF ZAMBIA RAILWAYS – AUDIT FINDINGS

4.1 Safety and Occupational Health Management at Zambia Railways

4.1.1 Safety and Occupational Health Policy

Zambia Railways Limited has a company policy for safety and health at work.

Elements
Some of the elements of the policy are as follows:
- It is company policy that all possible steps be taken to ensure the health and safety of persons and to prevent damage to company property
- It is the duty of all employees to conform to company policy and safety codes of practice and accept to carry out responsibilities
- All employees with specific responsibility for health and safety must ensure that they are adequately represented in their absence
- All employees who authorise work to be carried out at any time must ensure that there are adequate health and safety arrangements in place
- The Factories Act of 1985 is to be complied with at all times, but this in itself is not enough. All employees should contribute towards making the work areas as safe as possible. All work methods should be periodically appraised to ensure that the safest possible methods are adopted.
The Board of Directors pledge to give full backing and support to the policy.

**Objectives**

"The safety policy shall guide and govern actions and judgement on methods of procedure in railway operations with consideration for economy, efficiency, reliability, legal and moral obligations and other aspects of management commitments”.

"Company policy requires that all reasonable measure be taken to protect employees from accidents while on duty. This calls for a continuing program to promote safety through the education of employees in the importance of safe work habits, application of work and operating rules and the elimination of hazardous conditions”.

"It is also company policy to comply promptly with regulations and directives of government or similar bodies having jurisdiction over such matters.

**Responsibilities**

The policy bestows responsibility upon every employee to take all reasonable measure to ensure personal safety, that of fellow employees, passengers and the public whilst on Railway equipment, right-of-way, work areas, premises, or other company property.

The key officers identified in the formulation and implementation of the policy and the development of standards include the Chief Executive (formulation), the Director of Human Resources (implementation), the Director of Technical Services (development of safety standards). Others are the Director of Finance, the Director of Traffic and Marketing, the Company Secretary, the Manager of Safety and Environment, Safety Inspectors, Heads of Department, Assistant Heads/Station Managers, Supervisors and workers generally.

It is indeed commendable that the organisation has a Manager – Safety and Environment at the headquarters.

**4.1.2 Zambia Railways Safety Rules**

ZRL has a rule-based safety system. The rules capture the following elements of safety:

- General Rules
- Office Safety
- Clothing and Footwear
- Personal Protective Equipment
- Fire Precautions
- Housekeeping
- Tools and Equipment
Working on or about Tracks
- Working on Signalling Equipment
- Getting on or off Locomotives and Wagons
- Working on or around Locomotives, Wagons or Trains
- Operating Handbrakes
- Operating Track Points
- Working on Locomotives
- Working on Wagons
- Handling and Storage of materials
- Lifting Equipment, Forklifter, Wheel-Barrow, Mobile Crane, Goods, etc
- Express Sheds, Stores, etc
- Garages
- Customer and Catering Services
- Working on or about Machines
- Grinding Wheels
- Electrical Circuits, Equipment, etc
- Cutting and Welding Equipment
- Gases, Acids, Explosives, Molten Metals, etc
- Manhole, Well, Trench, Sewer, Turntable Pit or Excavations
- Ladders, Platforms or Scaffords
- Cranes, Derricks, Hoists
- Handling Lifting Equipment, etc
- Poles
- Jacks
- Pipelines
- Mechanical refrigeration and airconditioning systems

4.1.3 Other Safety-Related Documents

These include the following:
- Train Accident Investigation Guide
- Operating Rules
- Operating Rules Appendix
- Accident Prevention and General Safety Practice
- Maintenance Instructions for Permanent Way

4.1.4 Non-ZRL Documents

One notable document that is reportedly used as a guide is the SADC Hazardous Material Handbook on the conveyance, handling, storage, and safe working with hazardous material.

Southern African Development Community (SADC) member Railways are encouraged to utilise the handbook to ensure the competence of all employees throughout Southern Africa. The handbook is for use by all personnel involved in acceptance, handling, loading, unloading, storage and conveyance of hazardous materials from one country to or through another country.
The document classifies hazardous commodities into 9 classes (including labelling codes) as follows:

Class 1 – Explosives
Class 2 – Gases: compressed, liquified or dissolved under pressure
Class 3 – Flammable Liquids
Class 4 – Flammable Solids
Class 5 – Oxidising Substances and Organic Peroxides
Class 6 – Poisonous (toxic) or Infectious Substances
Class 7 – Radioactive Materials
Class 8 – Corrosives
Class 9 – Miscellaneous Dangerous Substances

The document also specifies matters related to conditions of acceptance, packaging, labelling, precautions, marking, conveyance by passenger or mixed train; damaged packages, etc. The guidelines are in line with the International Maritime Dangerous Goods Code as produced by IMO and accepted by the UN.

4.1.5 Observations

The above arrangements notwithstanding, there is still room in occupational health and safety arrangements. It is recommended that site specific safety and occupational health plans be developed to address issues such as:

(a) Rapid safety shut down
(b) Area evacuation
(c) Plant evacuation
(d) Sabotage/Civil Disobedience
(e) Materials Handling
(f) Abnormal emissions
(g) Fire
(h) Operational Failure/Error
(i) Abnormal Occurrences
(j) Emergency Exercises
(h) Site-specific medical surveillance program

Protective equipment and clothing is not satisfactorily provided particularly in as far as it relates to jobbing side effects such as fumes, sands, boiler operations, welding, gas inhalation, fine metal dusts, noise, etc. These need to be systematically attended to
### 4.1.6 Safety and Occupational Health Checklist

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Policy</td>
<td>Yes, but commitment and appropriateness could be improved</td>
</tr>
<tr>
<td>✓ Has top management defined the organisation’s safety policy? Appropriateness? Commitment?</td>
<td>Yes, but commitment and appropriateness could be improved</td>
</tr>
<tr>
<td>2. Planning</td>
<td>The procedure could be improved</td>
</tr>
<tr>
<td>✓ Is there a procedure established and maintained to identify the most significant of the organisation's safety aspects?</td>
<td>A procedure exists but needs improving and updating</td>
</tr>
<tr>
<td>✓ Has a procedure been established to have access to legal and other requirements to which the organisation subscribes that are directly applicable to safety impacts?</td>
<td>Partially established</td>
</tr>
<tr>
<td>✓ Have objectives and targets been established at each relevant function and level within the organisation?</td>
<td>Partially at some functions and levels but not all</td>
</tr>
<tr>
<td>✓ Is there a safety and occupational health management program for achieving objectives and targets?</td>
<td>Partially established</td>
</tr>
<tr>
<td>3. Implementation and Operation</td>
<td>Yes, partially</td>
</tr>
<tr>
<td>✓ Are roles, responsibilities, and authorities defined, documented and communicated? Are resources essential for implementation of a safety policy and program provided?</td>
<td>Yes, partially</td>
</tr>
<tr>
<td>✓ Have training needs been identified and have appropriate personnel received the necessary training? Safety Awareness?</td>
<td>Partially; in need of improvement</td>
</tr>
<tr>
<td>✓ Are procedures established and maintained for internal and external communication about significant safety aspects</td>
<td>Procedures need significant improvement</td>
</tr>
<tr>
<td>✓ Are warning signs and notices</td>
<td></td>
</tr>
<tr>
<td>ELEMENT</td>
<td>COMMENT</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>appropriately and strategically displayed?</td>
<td>There is need for updating and improving</td>
</tr>
<tr>
<td>✓ Are procedures for controlling all documents established, maintained and readily available?</td>
<td>Not always</td>
</tr>
<tr>
<td>✓ Have operations that are associated with significant safety impacts been identified?</td>
<td>Partially</td>
</tr>
<tr>
<td>✓ Are procedures that identify the potential for and the response to accidents and emergency situations established and maintained?</td>
<td>There is need for improvement and updating</td>
</tr>
<tr>
<td>4. Checking and Corrective Action</td>
<td>Procedures could be improved</td>
</tr>
<tr>
<td>✓ Are procedures established and maintained to monitor and record on a regular basis the key characteristics of the operations and activities that have a significant impact on safety?</td>
<td>Yes, procedures are established but they could be improved</td>
</tr>
<tr>
<td>✓ Are procedures established and maintained for handling and investigating nonconformance and for initiating corrective and preventive action?</td>
<td>Yes, partially</td>
</tr>
<tr>
<td>✓ Are procedures established and maintained for the identification and maintenance of safety records?</td>
<td>Programs and procedures are unsatisfactory</td>
</tr>
<tr>
<td>✓ Are programs and procedures established and maintained for periodic safety audits?</td>
<td></td>
</tr>
<tr>
<td>5. Management Review</td>
<td></td>
</tr>
<tr>
<td>✓ Does top management review the safety management system to ensure continuing suitability, adequacy and effectiveness?</td>
<td>Sometimes, but not on a regular basis</td>
</tr>
</tbody>
</table>
4.2 Environmental Management at Zambia Railways

4.2.1 General

ZRL has not established an environmental management system that meets the requirements of ISO 14001 or similar standard. There is, however, growing interest at ZRL to formulate an environmental policy. It is envisaged to use a staged bottom-up approach. Until about two years ago, the Safety Department then, was largely concerned with safety matters only. The position of Manager, Safety was renamed Manager, Safety and Environment only about a year ago. The environment agenda is therefore relatively new at ZRL.

4.2.2 Environmental Policy

ZRL has not yet defined the organisation’s environmental policy. Consequently the nature, scale and environmental impacts of ZRL’s activities, products and services are not documented. In the absence of an environmental policy, commitment to continual improvement; and compliance with applicable environmental legislation and regulations are not guaranteed. Furthermore there is no framework for setting and reviewing environmental objectives and targets. A further consequence is that an undocumented environmental policy can not be communicated to the employees and the public – further complicating the scenario.

4.2.3 Environmental Planning

Environmental Aspects

There is no procedure established and maintained to identify the organisation’s environmental aspects in order to determine which aspects have significant impacts on the environment.

Legal and other Requirements

There is no procedure established to identify and have access to legal requirements and other requirements to which the organisation subscribes that are directly applicable to environmental impacts.

ZRL is not in possession of any environment-related permits. The regulatory permits in place are safety-related. In addition, permits regarding fuel tanks are in place. Storage of fuel is guided by the Petroleum Act. Storage tanks are, by arrangement, however, the responsibility of Petroleum Companies (e.g. BP).

The last time the Environmental Council of Zambia (ECZ) visited ZRL was about 2 years ago. No concerns have been officially raised to date.
by ECZ regarding compliance. Furthermore, management is not aware of the sort of environmental regulatory permits that are required.

**Objectives and Targets**

Objectives and targets have not been established at each relevant function and level within the organisation.

**Environmental Management Programs**

ZRL has no established environmental management program for achieving environmental objectives and targets.

4.2.4 Implementation and Operation

**Structure and Responsibility**

Roles, responsibility and authorities are not adequately defined, documented or communicated. Consequently resources are not systematically provided.

Management has appointed a Manager, Safety and Environment with roles, responsibilities and authority yet to be fully defined vis-a-vis the implementation and maintenance of an environmental management system.

The Safety and Environment Inspector stationed at the workshops has the following roles:

(a) identifying areas of environmental concern  
(b) highlighting hazards  
(c) attending to and reporting all accidents giving possible causes  
(d) conducting safety inspections  
(e) ensuring availability of fire equipment and personnel  
(f) servicing of first aid facility  
(g) ensuring that safety posters are in place, updating accident records, etc

He has had some training in safety, first aid, fire prevention, etc. There is however a serious need to retrain him so that he may fully cope with his expanded responsibilities particularly with regard to the environment. Management also needs to accord more recognition and avail more resources to environment and safety activities. The same applies to other safety and environment inspectors.

**Training, Awareness and Competence**

Training needs have not been identified and appropriate personnel have not been identified. Furthermore, procedures are not in place to
make employees aware of the importance of conformance with environmental requirements and their specific responsibilities.

Generally speaking, environmental matters are not high on the company's list of priorities partly due to the financial problems the company is going through. More important though is the fact that environmental awareness is low. Almost all key personnel at the Central Workshops have not had any formal environmental training. Perhaps this is understandable since the environmental dimension of operations is relatively new at ZRL. Staff are unclear about their roles/responsibilities regarding the environment. They, nonetheless, show some notable concern and interest in environmental matters. Environmental matters, reportedly, do feature in management meetings but are not standing agenda items. Safety issues on the other hand, tend to be better understood and appreciated.

Communication

Procedures are not established and maintained for both internal and external communication about significant environmental aspects of environmental management.

Document Control

Procedures for controlling documents are not established, maintained or readily available. Consequently, current versions of relevant documents are not available in proper locations for effective use.

Operational Control

Operations and activities that are associated with significant environmental impacts have not been formally identified. For example, the following (internal) regulations are not in place:
(a) Hazardous waste regulations (only broad SADC guidelines exist)
(b) Regulations related to storage tanks
(c) Solid waste regulations
(d) Scheduled environmental inspection plans
(e) Formal hazardous material inventory

Emergency Preparedness and Response

Procedures that identify the potential for and the response to accidents and emergency situations (e.g. tank wagon accident spills) are not established and maintained. Consequently there are no procedures that specifically address the prevention and mitigation of environmental impacts that may be associated with accidents or emergency situations. Spill prevention control and counter measure plans are non-existent.
4.2.5 Checking and Corrective Action

Monitoring and Measurement

There are no procedures established and maintained to monitor and measure on a regular basis the key characteristics of the operations and activities that can have a significant impact on the environment. Consequently compliance with relevant environmental legislation and regulations can not be periodically evaluated. For example, the quality of groundwater (including the on-site borehole) and wastewater effluent from the sewage treatment plant are not regularly monitored. Similarly air quality is not monitored. The capacity to analyze those two aspects can quite easily be incorporated in the existing metallurgical laboratory.

Non-conformance and Corrective and Preventive Action

Procedures are not established and maintained for handling and investigating nonconformance, for taking action to mitigate the impacts caused by non-conformance and for initiating corrective and preventive actions.

Records

Procedures are not established and maintained for identification, maintenance and disposition of environmental records (training records, records of audit results, management reviews, etc).

Environmental Audits

There are no programs and procedures established for periodic environmental audits.

4.2.6 Management Review

ZRL has no Environmental Management System (EMS), consequently top management does not periodically and systematically review environmental management to ensure continuing suitability, adequacy and effectiveness. Environmental matters are currently reviewed on an adhoc basis.
4.3 Physical Environmental Status

4.3.1 Hazardous Waste

The major hazardous waste generation points at ZRL Kabwe Central Workshops include the following:
(a) The Carriage and Wagon Workshops
(b) The Motive Power Workshops
(c) The Production and Plant Maintenance Workshops
(d) The Loco Shed Annex Workshop

The above workshops also house the following activities:
Carpentry, millright, painting and refurbishing, foundry and smithy and air-conditioning/refrigeration; machine and components sections
The layout of the workshops is as appended to the report. The Central Workshops facility occupies an area of 22.8 Hectares. The total workshop manpower stands at 307. The workshops started operations in 1971. The site was previously used as farmland. Other noteworthy facilities at the site include a metallurgical laboratory and a sewage treatment plant.
There is also a borehole on-site connected to a water tank.

Responsibility for safety and environment matters on site is delegated to the Safety and Environment Inspector.

The main hazardous wastes/materials at the facility fall into the following major categories:
(a) Inorganic aqueous wastes (e.g. spent caustic baths from metal finishing/washings, rinse waters, etc)
(b) Oils and oily residues (used lubricating oils, used hydraulic oils, used cutting oils, contaminated fuel oils)
(c) Inorganic sludges/solids (sludges, dusts, solids and other non-liquid waste containing hazardous substances including dust from fabricated metal operations, waste sand from coking operations, furnace heavy metal slag, lime sludge from coking operations, etc)
(d) Organic sludges/solids (sludges from painting operations, soil contaminated with spilled solvent, paint residues/fumes, etc)
(e) Liquid/compressed gases

Copper concentrate droppings at Kitwe and other Copperbelt stations need special mention. ZRL transports copper concentrate from the mines. The concentrates are loaded onto unsealed train wagons while still wet. Consequently the various stations and railway lines on the Copperbelt are littered with copper concentrate droppings – leading to copper concentrate dust and corrosion of the rails. The ballast is also rendered ineffective and the state and integrity of the railway system are severely affected. The other consequence is possible groundwater pollution since the droppings are washed down by the rains during the rainy season.
The copper concentrate problem, therefore, has environmental, occupational health and safety dimensions. The problem should be attended to urgently.

4.3.2 Solid Waste

Solid waste collection and disposal is understood to be the responsibility of the local authority (municipal council). However, the Engineer, Production, and Maintenance has the responsibility to ensure that solid waste disposal is attended to. Some incineration takes place on site and the scrap metal is periodically shoved around and re-piled in order to bring some order to the facility. Generally speaking then, the arrangements for solid waste collection and disposal are haphazard. Solid waste regulations are not followed and indeed some solid wastes are transported out of the workshop premises without permits.

The major solid waste categories at the central workshops include scrap metal, furnace slag, machine shop swarf, saw dust, pot liner waste, and waste coke.

The total quantity of undisposed of slag, machine shop swarf, sawdust, potliner waste, and waste coke at the time of the audit was in the order of 100 – 200 Kg. Some of the sawdust is used for soaking the spillage oils, some is burnt and the remainder is collected by the Kabwe Municipal Council for disposal at their landfill site. The machine shop swarf is disposed of along with scrap metals. The potliner waste, waste coke and furnace slag are dumped at designated waste disposal locations within the workshop yard and levelled out from time to time.

Out of the above categories of solid waste, by far the greatest quantity is that of scrap metal which is strewn all over the premises. It is estimated that the total quantity of scrap metal – locomotive and wagon remains, wheels, rails, etc is in the order of 150 – 200 metric tonnes. Currently, ZRL has standing arrangements with a scrap metal company – Scaw Limited. At the time of audit, it was understood that the scrap metal had already been bought by Scaw and was simply awaiting collection.

4.3.3 Storage Facilities

ZRL handles huge quantities of fuel. It is estimated that over a 6 month period, as much as 1000 000 litres of diesel are used.

Fuel is stored at several ZRL stations and workshops. The estimated storage capacities are as follows:

(a) Central Workshops – 32 000 litres (Diesel + Used Oil) [4 tanks, 2 unbunded]
(b) Livingstone – 12 700 litres (Diesel + Petrol) [2 tanks, bunded]
(c) Choma – 18 200 litres (Petrol) [2 tanks, bunded]
(d) Monze bunded] 18 200 litres (Diesel +Petrol)[2 tanks, bunded]
(e) Kafue bunded] 347 500 litres(Diesel+Petrol)[2 tanks, bunded]
(f) Lusaka bunded] 76 910 litres(Diesel +Petrol)[2 tanks, bunded]
(g) Kabwe Station bunded] 45 100 litres(Diesel + Petrol)[2 tanks, bunded]
(h) Ndola bunded] 40 000 litres(Diesel+Petrol)[2 tanks, bunded]
(i) Kitwe bunded] 32 000 litres(Diesel+Petrol)[2 tanks, bunded]

Storage tanks are a mixture of above ground and underground tanks. Underground storage tanks are mainly for motor vehicle refuelling points at Ndola, Kabwe, Lusaka, Kafue, Choma and Livingstone.

Permits exist for petroleum storage tanks although the responsibility for the integrity and safety of the tanks lies with the petroleum companies themselves. There have been incidents of leaking pipes connected to the tanks. At the time of audit, no leakages were detected. The quantities of fuel lost during past leakages and the frequency of leakages could not be established due to a dearth of systematic records. Two of the tanks at Central Workshops do not have bund walls. This is unsatisfactory and should be attended to at once. There is also need to put in place an internal self inspection program for storage facilities to supplement whatever arrangements are in place with the petroleum and gas companies.

Some gas is also stored at the Kabwe Central Workshops – mainly oxygen and LPG. Again the responsibility for the integrity of the tanks lies with the gas companies themselves.

Used oil is also stored on site and arrangements were once in place to resale it to the suppliers. Stored quantities are in the order of 20 000 to 30 000 litres at any one time.

The storage areas are not all properly identified by well placed posters.

Another concern is the fact that no environmental impact assessments were conducted prior to installation of fuel and lubricant storage tanks.

4.3.4 Waste Discharges and Disposal

Liquid waste discharges mainly consist of oil-water/oil washing mixtures. Small percentages of acid and caustic soda also find their way into the drains. The oily discharges are discharged into the drains and subsequently into the environment adjoining the workshops. There has been no formal concern by the local authority or the water board to
date. This is a major concern and needs to be attended to at once. The practice is in violation of existing legal provisions governing the protection of the environment and in particular the discharge of effluent regulations (Environmental Protection and Pollution Control Act and the Local Government Act).

4.3.5 Waste Treatment and Disposal

A simple Aerator+ Sedimentation Tank arrangement exists on site. The treated effluent is discharged into the workshops drainage system and finds its way to the same discharge point as the oily discharges.

The effluent quality is not regularly monitored.

4.3.6 Health and Safety-Related Status

Workshop safety is guided by the Factories Act. The Abstract of the Act is posted in most of the workshops. Inspectors from government reportedly visit the workshops and certification of equipment is done by government.

Levels of air pollution are unknown since there is no monitoring program.

The potential health hazards at the facility include paint fumes in the paint shop particularly now that the paint booth fume extractor is non-functional. The facility uses about 500 litres of paint per week. The facility also produces significant amounts of fine metal dusts and noise. Jobbing side effects are also major concerns namely, fires, sands, fumes, boiler-related activities, welding, gases, etc. Hazards associated with specialised equipment such as pneumatic hammers, foundries, lathes, etc also need mention.

Notable also in the handling and conveyancing of goods are the copper concentrate droppings and the mine-related environmental pollution on the Copperbelt. ZRL is involved in the transportation of Zambia’s mined copper and other minerals.

It was noted that safety attire and accessories are not very satisfactorily provided at the moment – perhaps due to financial constraints.

4.3.7 Miscellaneous Environmentally Significant Attributes

There is a metallurgical laboratory on the workshop premises that can quite easily be made to cater for water, waste water and air quality monitoring. At the moment the laboratory is used for quality control of raw materials for the foundry.
The central workshops handle a significant number of locomotive batteries and some locomotive battery charging takes place in the workshops.

Oxygen and propane gases are extensively used.

The company has a track weed control program that reportedly uses proprietary approved chemical. The environmental impact of the use of these chemicals are unknown.

Coolant and sawdust are also extensively strewn in some of the workshops highlighting the need for good house keeping and cleaner production.

Equipment and machinery is in neglected states in some of the workshops perhaps due to obsoleteness. An equipment audit is recommended.

The company also uses a lot of wood. Most of the sleepers are wooden. Although there is an on-going re-sleepering program that aims to replace wooden sleepers with concrete ones, it would appear that given the current financial situation of the company, wooden sleepers will remain more cost effective for some time to come. The environmental impact of the company’s use of wooden sleepers as it relates to deforestation should be investigated.

4.3.8 Goods Transported on ZR and their environmental Impacts

The categories of major goods carried in bulk on Zambia Railways include the following:

- Cement
- Pyrites
- Nitric and Sulphuric Acids
- Nitrates
- Fertilisers
- Scrap Metal
- Containers
- Maize
- Edible Oils
- Petroleum Products
- Copper and other Minerals
- Livestock
- Lime

The major environmental hazard is associated with accidents and leakages involving acid and petroleum products tanks. A spill response and counter measure are not in place. In the case of acid transported for
the mining companies, for example, ZRL relies on the mining companies for leakage/spill response expertise. This should be reviewed. Another concern is associated with the transportation of copper concentrates on the Copperbelt. The copper concentrate droppings pose safety, environmental and occupational health risks which need to be tackled in conjunction with the mining companies. It is recommended that the mining companies be persuaded to resume using sealed wagons for transporting copper concentrates. A clean up program for contaminated sites should also be introduced.

4.3.9 Illegal Products Transported on ZR and their Environmental Impacts

To date, illegal products have not been a significant problem in the operations of ZRL.

5 ENVIRONMENTAL AND SAFETY CONCERNS/LIABILITY ISSUES AND IMPROVEMENT PROPOSALS

5.1 Major Concerns

The previous land use of the site of the current Kabwe Central Workshops was crop farming. There are no visible signs of degradation of this relatively environmentally friendly past use. Consequently the concerns discussed below largely apply to both the past and on-going use of the site as workshop premises. The concerns apply to all ZRL workshops and stations.

<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of an environmental policy and an environmental management system</td>
<td>ZRL top management needs to commit itself to developing and implementing an Environmental Management System (EMS), carry out an initial environmental review and develop a policy. The policy must be relevant to the nature, scale and environmental impacts of the organisation’s activities, products and services. ZRL has committed itself to evolving a policy and introducing an EMS during the course of the year 2000 through a series of meetings and dialogues.</td>
<td>HIGH</td>
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<tr>
<td>CONCERNS</td>
<td>IMPROVEMENT PROPOSALS</td>
<td>PRIORITY</td>
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<tr>
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<tr>
<td></td>
<td>with the various departments. The effort is to be coordinated by the Manager, Environment and Safety. A detailed programme is still being developed.</td>
<td></td>
</tr>
</tbody>
</table>

- **Environmental Planning**
  - **Objectives and targets**
  - **Environmental management programs**
    - ZRL will then need to develop a detailed plan incorporating, for example, organisation and personnel; register of environmental legislation and regulations; evaluation of effects; objectives and targets, etc. The above should feed into a management program

- **Implementation and Operation**
  - **Roles and responsibilities**
    - The EMS will need to be integrated into the company's operations. In this regard, the following will need to be attended to:
      - Distribution of environmental responsibility throughout the organisation, through the management team and employees
      - Provision of regular feedback to management and employees of the organisation's conformance to the EMS
      - Consider ways to broaden traditional roles to include environmental management

- **Training, awareness and competence**
  - There will be need to create awareness and provide training in environmental
<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
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<tbody>
<tr>
<td></td>
<td>matters. The training required is therefore of two types:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- General awareness</td>
<td></td>
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<tr>
<td></td>
<td>- Training for competence</td>
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</tr>
<tr>
<td>Environmental</td>
<td>- Maintaining internal communication between various functions and levels of the</td>
<td></td>
</tr>
<tr>
<td>communication</td>
<td>organisation</td>
<td></td>
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<tr>
<td></td>
<td>- Receiving, documenting and responding to relevant communication from external</td>
<td></td>
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<tr>
<td></td>
<td>interested parties regarding environmental aspects and the EMS</td>
<td></td>
</tr>
<tr>
<td>Documentation and</td>
<td>- Simply, “Say what you do and do what you say”</td>
<td></td>
</tr>
<tr>
<td>Document control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational control</td>
<td>- Establish and maintain documented procedures to cover situations where their</td>
<td></td>
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<td></td>
<td>absence could lead to deviation from environmental policy, and the objectives and</td>
<td></td>
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<td></td>
<td>targets</td>
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<tr>
<td></td>
<td>- Stipulate operation criteria and procedures</td>
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<tr>
<td></td>
<td>- Establish and maintain procedures related to significant environmental aspects of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>goods and services</td>
<td></td>
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<tr>
<td>Emergency preparedness</td>
<td>ZRL will need to plan for emergency environmental response, perhaps model potential</td>
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<td></td>
<td>releases and document the most effective release mitigation techniques for its</td>
<td></td>
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<td></td>
<td>operations, particularly the</td>
<td></td>
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<tr>
<td>CONCERNS</td>
<td>IMPROVEMENT PROPOSALS</td>
<td>PRIORITY</td>
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<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>transportation of goods such as acids, petroleum products and hazardous wastes in general.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Checking and Corrective Action Records</td>
<td>The elements to be considered include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Procedures to monitor and measure on a regular basis key characteristics of operations and activities that can have a significant impact on the environment; tracking performance, calibration of equipment and periodic evaluation of compliance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• It is also important to establish and maintain procedures for handling, investigating and initiating corrective and preventive action for nonconformance, maintain environmental records and carry out regular environmental audits.</td>
<td></td>
</tr>
<tr>
<td>Management Review</td>
<td>Management reviews will need to be performed at regular intervals in order to ensure that the EMS is suitable, adequate and effective.</td>
<td></td>
</tr>
<tr>
<td>2. Hazardous Waste Management</td>
<td>ZRL should introduce cleaner production practices aimed at:</td>
<td>HIGH</td>
</tr>
<tr>
<td>Poor handling at</td>
<td></td>
<td></td>
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</tbody>
</table>
### Concerns

<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source (housekeeping, waste minimisation, cleaner production, etc)</td>
<td>Waste minimisation, good housekeeping and waste segregation, where possible. Consideration should also be given to the 3 Rs- Reduce, Reuse, Recycle</td>
<td>MEDIUM</td>
</tr>
</tbody>
</table>

**Poor disposal practices for:**

- Inorganic aqueous wastes
- Oils and oily residues (used lubricating oils, hydraulic oils, cutting oils, contaminated fuel oils)
- Inorganic sludges/solids (sludges, dusts, solids and other non-liquid waste containing hazardous substances including dust from fabricated metal operations, waste sand from coking operations, lime sludges from coking operations, etc)
- Organic sludges/solids (sludges from painting operations, soil contaminated with spilled solvent, paint residues/fumes, etc)

### Solid Waste

**Adhoc collection and disposal arrangements**

A more organised solid waste management system
<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>for solid waste</td>
<td>should be put in place – perhaps with the cooperation of the Environmental Council of Zambia and the Kabwe Municipal Council</td>
<td></td>
</tr>
<tr>
<td>Uncontrolled burning of wastes at the central workshops</td>
<td>Proper procedures and sites must be declared for burning wastes in line with legal requirements</td>
<td></td>
</tr>
<tr>
<td>Huge quantities of scrap metal strewn all over the workshop premises</td>
<td>More ordering and sorting of scrap metal is recommended. Final disposal arrangements also need to be worked out</td>
<td></td>
</tr>
<tr>
<td>4. Storage Facilities(gases and petroleum products)</td>
<td>The Safety and Environment Inspector at the Kabwe Central workshops needs to be trained in the basics of inspections related to the integrity and safety of tanks in order to enhance his role. Other staff will need awareness training</td>
<td>LOW</td>
</tr>
<tr>
<td>Lack of a formalised internal inspection system for integrity and safety of tanks</td>
<td>Discussions need to be entered into with the oil companies on the currency and environmental friendliness of their storage tank technologies as they relate to facilities at ZRL</td>
<td></td>
</tr>
<tr>
<td>Leaking pipes have been reported in the past but the incidents have not been properly documented</td>
<td>Unbunded tanks are a source of concern</td>
<td></td>
</tr>
<tr>
<td>Well placed posters identifying stored tank contents lacking</td>
<td>Posters identifying the contents of storage tanks should be appropriately placed</td>
<td></td>
</tr>
<tr>
<td>5. Waste Discharges and Disposal</td>
<td>As under, &quot;Hazardous Waste&quot;</td>
<td>HIGH</td>
</tr>
<tr>
<td>Lack of systematic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONCERNS</td>
<td>IMPROVEMENT PROPOSALS</td>
<td>PRIORITY</td>
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<tr>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>control and segregation of wastes at source</td>
<td>The performance of the treatment plant must be regularly monitored</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Uncontrolled draining of admixtures of waste into ordinary drains</td>
<td>The effluent quality should be periodically determined and recorded</td>
<td></td>
</tr>
<tr>
<td>Inorganic aqueous wastes, oils and oily residues are all freely discharged into unauthorised areas potentially polluting surface waters, groundwaters and the environment generally</td>
<td>The wastewater treatment plant effluent must be discharged separately from the other liquid wastes – the effluent must ideally be discharged into the council sewer system</td>
<td></td>
</tr>
<tr>
<td>6. Waste Treatment and Disposal</td>
<td>The performance of the treatment plant is not monitored regularly. The same applies to the quality of the treated effluent.</td>
<td></td>
</tr>
<tr>
<td>The wastewater treatment plant discharges its effluent into the ordinary drainage system of the premises. The effluent is mixed with drainage waters (aqueous wastes, oils and oily residues) and is ultimately discharged freely into the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Safety and Occupational Health</td>
<td>Air pollution monitoring should be introduced</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Levels of air pollution are unknown since there is no monitoring program</td>
<td>Site-specific environment,</td>
<td></td>
</tr>
<tr>
<td>CONCERNS</td>
<td>IMPROVEMENT PROPOSALS</td>
<td>PRIORITY</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Inadequate site specific health and safety plans – including a site specific medical surveillance program.</td>
<td>health and safety plans should be developed as well as site-specific medical surveillance programs</td>
<td>LOW</td>
</tr>
</tbody>
</table>

*Potential health hazards include:*

- Paint fumes
- Fine metal dusts
- Noise
- Vibrating equipment
- Hazards associated with handling and conveyancing of copper concentrates on the Copperbelt

*Other safety gaps include:*

- Inadequate, appropriate safety attire and accessories
- Slippery, oily floors
- Lack of regular safety training for all
- Inadequate strategically placed warning signs, posters
- Inadequate arrangements for management review
- Inadequate recognition of role of safety inspector

<table>
<thead>
<tr>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate safety attire should be provided to staff</td>
<td>LOW</td>
</tr>
<tr>
<td>The workshop floors should be kept free of oils</td>
<td>LOW</td>
</tr>
<tr>
<td>Safety training – competence and awareness should be provided to all employees</td>
<td>LOW</td>
</tr>
<tr>
<td>Management should put in place procedures to regularly review safety arrangements</td>
<td>LOW</td>
</tr>
<tr>
<td>The profile of the safety and environment officer should be recast and enhanced</td>
<td>LOW</td>
</tr>
</tbody>
</table>

8. Miscellaneous
<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>IMPROVEMENT PROPOSALS</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedures/regulations for handling and charging locomotive batteries</td>
<td>Formal procedures and regulations must be developed</td>
<td></td>
</tr>
<tr>
<td>Lack of regular and sustained monitoring of borehole water supply</td>
<td>Borehole water quality should be regularly monitored – perhaps by incorporating a water/wastewater aspect to the operations of the metallurgical laboratory</td>
<td></td>
</tr>
<tr>
<td>Track weed control program</td>
<td>The environmental impact of the track weed control program should be investigated</td>
<td></td>
</tr>
<tr>
<td>Coolant, sawdust and other miscellaneous wastes</td>
<td>A sense of orderliness and simple environmental cleanliness should be inculcated into staff</td>
<td></td>
</tr>
<tr>
<td>State of equipment and machinery</td>
<td>An equipment audit would help in determining working/useful and obsolete equipment</td>
<td></td>
</tr>
<tr>
<td>Environmental implications of use of wooden sleepers by company</td>
<td>In collaboration with relevant national agencies, an emergency preparedness and response plan must be developed</td>
<td></td>
</tr>
<tr>
<td>9. Transported Goods</td>
<td>In collaboration with the mining companies, ZRL</td>
<td>HIGH</td>
</tr>
<tr>
<td>Inadequate formalised and updated emergency preparedness and response plan</td>
<td>In collaboration with the mining companies, ZRL</td>
<td></td>
</tr>
<tr>
<td>• Petroleum products and acids spill response and counter measure plan</td>
<td>In collaboration with the mining companies, ZRL</td>
<td></td>
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</tbody>
</table>
## 5.2 Major Liability Issues

<table>
<thead>
<tr>
<th>CONCERN</th>
<th>LIABILITY</th>
<th>IMPROVEMENT PROPOSAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operations without environmental permits or licenses on air, water, waste and toxic substances</td>
<td>Liable for prosecution under the Environmental Protection and Pollution Control Act (EPPCA)</td>
<td>ZRL management to apply for relevant permits and licenses</td>
</tr>
<tr>
<td>2. Lack of monitoring of environmental pollutants released at various facilities</td>
<td>Liable for prosecution and remediation costs under the &quot;polluter pays principle&quot; of EPPCA</td>
<td>ZR should consider upgrading its metallurgical laboratory to cater for basic environmental monitoring</td>
</tr>
<tr>
<td>3. Disposal of admixtures of waste oil, acids, caustic soda, etc into an unauthorised area and without pretreatment</td>
<td>Liable for prosecution and damages (environment, water resources); clean-up costs</td>
<td>ZRL should improve on house keeping, waste minimisation, segregation of wastes, pretreatment, etc</td>
</tr>
<tr>
<td>4. Lack of an environmental preparedness and response plan</td>
<td>Potential liability for prosecution resulting from contingent environmental damage</td>
<td>ZRL should develop an environmental emergency and preparedness plan</td>
</tr>
<tr>
<td>5. Environmental, occupational health and safety liabilities arising out of the unmitigated</td>
<td>Liable for prosecution and remediation costs associated with environment, safety and occupational health</td>
<td>ZRL must, in collaboration with ZCCM immediately ensure that wagons carrying copper concentrates are</td>
</tr>
</tbody>
</table>
5.3 Environmental Impact Assessments for Future Rehabilitation Works

Under the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997, a developer shall not implement a project for which a project brief or an environmental impact assessment is required unless the the project brief or environmental impact assessment has been concluded in accordance with the regulations and a decision letter has been issued by the Environmental Council of Zambia. This requirement also applies to significant alterations/rehabilitions.

6. CAPACITY OF THE ENVIRONMENTAL COUNCIL OF ZAMBIA (ECZ) AND THE GOVERNMENT OF THE REPUBLIC OF ZAMBIA (GRZ) TO MONITOR CONTINGENT ENVIRONMENTAL DAMAGES

The Environmental Council of Zambia (ECZ) and its inspectorates are still very much in their infancy. The Environmental Protection and Pollution Control Act (EPPCA) was passed by Parliament in 1990. Setting up the ECZ took some years after that and the putting in place of regulations is still in progress. The ECZ is expected to perform advisory, coordinating and regulatory functions on environmental matters in Zambia. The inspectorates under ECZ have powers to enforce the provisions of the Act and any other regulations under the Act. Furthermore, the EPPCA has provision for the delegation of the enforcement of specific regulations or guidelines to local authorities. The subsidiary regulations currently in place are as follows:

- Pesticides and Toxic Substances Regulations(1994)
- Water Pollution Control (Effluent and Wastewater) Regulations (1993)
- Waste Management (Transporters and Waste Disposal Site) (1993)
- Air pollution Control (Licensing and Emission Standards) Regulations (1996)
- Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations (1997)

Other regulations including those dealing specifically with hazardous waste are still under development. Solid waste collection and disposal is currently the responsibility of local authorities.

There are currently no established environmental monitoring programs even for non-contingent environmental damages. There are, in effect, no systems in place for systematic and continuous data generation and recording. It should be noted however, that from time to time, the ECZ publishes “State of the Environment” reports which outline environmental trends and conditions in the country. The reports tend to be very general in nature and their usefulness in monitoring contingent environmental damages is negligible. It must be noted, nonetheless, that several capacity building projects/programs under both the ECZ and the Ministry of Environment and Natural Resources are being implemented with the aid of donor agencies.
In the current scheme of things therefore, it can be safely argued that there is no reliable capacity to monitor contingent environmental damages on the part of the Environmental Council of Zambia or indeed the Government of the Republic of Zambia (GRZ). Efforts are, however, underway to develop that capacity.

7. CONCLUSIONS

The existing environmental (including safety and occupational health) conditions, practices and potential liabilities of Zambia Railways Limited were evaluated against national and international standards. The evaluation took full cognisance of the fact that environmental policies, legislation, institutions and debate are still in their infancy in Zambia. The following are the major conclusions:

- ZRL has a fairly elaborate company policy (with associated rules and procedures) for safety and health at work. The company, however, has no site specific safety and occupational health plans. Furthermore, adequate and appropriate protective equipment, clothing and accessories are in short supply. Safety and occupational health training is not regularly availed to all employees.

- ZRL has neither an environmental policy nor an environmental management system. There is, however, growing interest at ZRL to formulate an environmental policy. It is commendable to note that ZRL has a safety and environment department headed by a manager. The environment function was added to the department just over a year ago. The environment agenda is therefore relatively new at ZRL.

- ZRL is an enterprise in serious need of both technical and managerial know-how in order to improve environmental management and performance. There is inadequate environmental knowledge and skills generally. There is also inadequate knowledge of relevant pieces of legislation and regulations; and compliance requirements. ZRL does not have any environmental permits obtainable under the Environmental Protection and Pollution Control Act. Environmental checking and corrective actions are also non-existent.

- Significant amounts of hazardous wastes are generated by ZRL. These include fuel and lubricant oil wastes/admixtures, furnace heavy metal slag and wastewaters entrained with caustic soda. The handling and disposal of hazardous materials does not conform to cleaner production practices.

- The arrangements for solid waste collection and disposal are haphazard. The major solid waste categories include scrap metal, furnace slag, machine shop swarf, saw dust and waste coke.

- ZRL handles huge quantities of petroleum fuel and lubricant oils. Storage tanks are a mixture of above ground and underground tanks. Permits exist for storage tanks although the responsibility for the integrity and safety of the tanks lies with the petroleum and gas companies themselves. There is no formal self inspection program for storage facilities and the storage areas are not always properly identified by posters.

- Liquid waste discharges mainly consist of oil-water/oil-washings admixtures. Small percentages of acid and caustic soda also find their way into drains. The oily discharges are freely discharged into unauthorised areas adjacent to the workshops. The situation is very unsatisfactory.
There is a serious environmental, occupational health and safety problem associated with copper concentrate droppings at Kitwe, other Copperbelt towns and on the Copperbelt lines generally. The copper concentrate droppings dust is an occupational health hazard particularly for shunting staff. Furthermore, the droppings are extremely corrosive to rails and the state and integrity of the railway system have been severely affected.

There is no air pollution monitoring program.

The potential health hazards at the workshops include paint fumes, fine metal dusts and noise. The hazards associated with copper concentrate handling/loading and mine-related environment pollution on Zambia's Copperbelt also need mention.

The quality of the borehole water at the central workshops is not regularly monitored.

The environmental impacts of ZRL's track weed control program (chemical spray) and the use of wooden sleepers are unknown. This is unsatisfactory.

The company has no environmental emergency preparedness and response plan. This is highly unsatisfactory and can lead to prosecution and remediation costs associated with contingent environmental damages caused by transported goods, for example.

The Environmental Council of Zambia (ECZ) and its inspectorates are still very much in their infancy. Zambia's supreme environmental legislation, the Environmental Protection and Pollution Control Act was enacted in 1990. Setting up the ECZ took some years after that and the putting in place of regulations is still in progress. There are currently no established environmental monitoring programs even for non-contingent environmental damages. The capacity of ECZ to monitor contingent environmental damages needs to be augmented.

The above conclusions on the environmental status of ZRL should be considered against a background of a nascent but evolving national policy, legislative and institutional framework.

8. ACTION PLAN

8.1 Remediation and Monitoring Plan

The plan is developed against a background of lack of environmental data for planning in the country and at ZRL in particular. Both the quantities and qualities of waste discharges are largely unknown due to the absence of environmental policies and management systems. The need for taking corrective action is however there and the following action plan attempts to do that.

<table>
<thead>
<tr>
<th>Program</th>
<th>Objectives</th>
<th>Output</th>
<th>Activities</th>
<th>Responsibility</th>
<th>Priority and Estimated Initial Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Development of an environmental policy and putting in place</td>
<td>To bring ZRL in line with international standards of environmental</td>
<td>Environmental Policy</td>
<td>Declared commitment by management</td>
<td>Concessionaire</td>
<td>HIGH US$ 100 000</td>
</tr>
<tr>
<td>Program</td>
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<tr>
<td>of an environmental management system at ZRL incorporating the following elements:</td>
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<tr>
<td>- Environmental Policy</td>
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<td></td>
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</tr>
<tr>
<td>- Environmental Planning</td>
<td></td>
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<tr>
<td>- Implementation and Operation</td>
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<tr>
<td>- Checking and Corrective Action</td>
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<tr>
<td>- Management Review</td>
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<tr>
<td>(Refer Chapter 5: Environmental and safety concerns and improvement proposals for details)</td>
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<td></td>
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<tr>
<td>2. Development and introduction of cleaner production practices including good housekeeping, waste minimisation, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Installation, operation and maintenance of pollution control</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Output</th>
<th>Activities</th>
<th>Priority and Estimated Initial Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>management while at the same time taking full cognisance of Zambia’s peculiarities, stage of development and laws.</td>
<td>Management System An environmentally friendly and competent ZRL; an environmentally enlightened and competent workforce.</td>
<td>Initial environmental review Policy development EMS development EMS implementation and review</td>
<td>Concessionaire in collaboration with ECZ US$ 50 000</td>
</tr>
<tr>
<td>To bring ZRL into conformity with best practices in cleaner production</td>
<td>A “cleaner” ZRL</td>
<td>Training courses and workshops Review of practices Implementation of cleaner production practices</td>
<td></td>
</tr>
<tr>
<td>To bring ZRL into compliance with national and environmentally friendly and compliant ZRL with pollution loads and characteristics</td>
<td></td>
<td></td>
<td>ZRL Board and management in collaboration with ECZ, the Inspectorate of Factories and</td>
</tr>
</tbody>
</table>

<p>| US$ 150 000 |</p>
<table>
<thead>
<tr>
<th>Program</th>
<th>Objectives</th>
<th>Output</th>
<th>Activities</th>
<th>Responsibility</th>
<th>Priority and Estimated Initial Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>equipment such as oil separators, fume extractors, etc and adoption of better methods of final disposal of hazardous wastes</td>
<td>international standards in pollution control</td>
<td>appropriate pollution control equipment and informed methods of waste disposal</td>
<td>Purchase and installation of equipment</td>
<td>Kabwe Municipal Council</td>
<td></td>
</tr>
<tr>
<td>4. Clean up Contaminated sites including central workshops, loco shed, motor vehicle maintenance workshops and unauthorised disposal areas adjacent to workshops and sites contaminated by copper concentrate droppings on the Copperbelt</td>
<td>Ditto</td>
<td>Ditto</td>
<td>Ditto</td>
<td>Ditto</td>
<td>HIGH USD 150 000</td>
</tr>
<tr>
<td>5. Development and implementation of a solid waste collection and disposal system - including a system for storing and disposal of scrap metals Consider securing and operating a secure waste</td>
<td>To bring ZRL into compliance with national legislation and in line with best practice</td>
<td>A more environmentall y friendly and compliant ZRL with clean premises and an organised scrap metal handling program</td>
<td>Assessment of wastes generated and their characteristics</td>
<td>Concessionaire in collaboration with Kabwe Municipal Council and ECZ</td>
<td>MEDIUM USD 60 000</td>
</tr>
<tr>
<td>Program</td>
<td>Objectives</td>
<td>Output</td>
<td>Activities</td>
<td>Responsibility</td>
<td>Priority and Estimated Initial Costs</td>
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<tr>
<td>disposal site</td>
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<td></td>
</tr>
<tr>
<td>6. Training the Safety and Environment Inspectors in matters related to storage facilities</td>
<td>To develop safety and environment inspectors appropriate levels of competence</td>
<td>Enlightened, informed, competent Safety and Environment Inspectors in matters related to storage</td>
<td>Workshops and training courses</td>
<td>Concessionaire</td>
<td>LOW US$30 000</td>
</tr>
<tr>
<td>7. Introduction of a wastewater treatment plant operation and maintenance program and an effluent quality monitoring program</td>
<td>To monitor the performance of the wastewater treatment plant and the effluent quality</td>
<td>An operational wastewater treatment plant and effluent monitoring program with systematic records</td>
<td>Develop monitoring program and implementation schedule</td>
<td>ZRL Board and management with cooperation of ECZ and Kabwe Municipal Council</td>
<td>MEDIUM US$50 000</td>
</tr>
<tr>
<td>8. Introduction of an air pollution monitoring program</td>
<td>To monitor ambient air quality in view of the location of central workshops in particular</td>
<td>Air quality monitoring program and associated records</td>
<td>Develop program, perhaps with the assistance of ECZ</td>
<td>Concessionaire in collaboration with ECZ</td>
<td>MEDIUM US$30 000</td>
</tr>
<tr>
<td>9. Development and implementation of site-specific environment, health and safety</td>
<td>To develop a detailed framework for health, safety and environment matters</td>
<td>Site-specific, effective environment, safety and health plans</td>
<td>Develop programs</td>
<td>Concessionaire</td>
<td>MEDIUM US$70 000</td>
</tr>
<tr>
<td>Program</td>
<td>Objectives</td>
<td>Output</td>
<td>Activities</td>
<td>Responsibility</td>
<td>Priority and Estimated Initial Costs</td>
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<tr>
<td></td>
<td>plans; medical surveillance programs. Acquisition of specialised equipment for testing and pollution monitoring.</td>
<td></td>
<td></td>
<td></td>
<td>MEDIUM US$ 60 000</td>
</tr>
<tr>
<td>10. Acquisitio n and provision of appropriat e safety attire for staff</td>
<td>To protect health and safety of employees</td>
<td>Protective attire and accessories for staff in use</td>
<td>Create awareness among staff about protective equipment</td>
<td>ZRL Board and management/C oncessionaire</td>
<td></td>
</tr>
<tr>
<td>11. Competen ce and awareness safety and environment training for all staff</td>
<td>To raise the level of awareness and competence of staff in environment and safety matters</td>
<td>Competent and aware staff</td>
<td>Workshops, short courses</td>
<td>ZRL Board and management/C oncessionaire</td>
<td>HIGH US$ 40 000</td>
</tr>
<tr>
<td>12. Establishm ent of manageme nt review procedures (as part of an EMS)</td>
<td>To review the adequacy, suitability and effectiveness of systems</td>
<td>Feedback into system and continual improvement</td>
<td>Implement as part of EMS</td>
<td>Concessionaire</td>
<td>HIGH As part of 1</td>
</tr>
<tr>
<td>13. Acquisitio n of environment</td>
<td>To bring ZRL into compliance</td>
<td>Environmental permits, licences</td>
<td>Apply for licences, permits</td>
<td>ZRL</td>
<td>HIGH US$ 500</td>
</tr>
<tr>
<td>Program</td>
<td>Objectives</td>
<td>Output</td>
<td>Activities</td>
<td>Responsibility</td>
<td>Priority and Estimated Initial Costs</td>
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<tr>
<td>Environmetal licences and permits</td>
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<tr>
<td>14. Miscellaneous programs</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• Environmental Impact Assessment of Track Weed Control Program</td>
<td>To assess the environmental impacts of:</td>
<td>Knowledge of environmental impacts of ZRL's miscellaneous activities;</td>
<td>Implement as listed after developing specific action plans</td>
<td>Concessionaire</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>• Track weed control program</td>
<td>water quality monitoring program;</td>
<td></td>
<td></td>
<td>US$ 10 000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rationalisation of equipment inventory/use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Environmental Impact Assessment of Use of Wooden Sleepers by ZRL</td>
<td>• Use of wooden sleepers by ZRL</td>
<td></td>
<td></td>
<td></td>
<td>US$ 10 000</td>
</tr>
<tr>
<td></td>
<td>To assess the usefulness of equipment stocks, rehabilitation and disposal</td>
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<td></td>
<td>options, etc</td>
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<tr>
<td>• Equipment audit and implementation of recommendations</td>
<td>To monitor the quality of the borehole water supply at central workshops</td>
<td></td>
<td></td>
<td></td>
<td>US$ 20 000</td>
</tr>
<tr>
<td>• Monitoring of quality of borehole water</td>
<td>To determine the impact on the environment to date of the free discharge</td>
<td>Environmental Impact Report</td>
<td>Commission EIA study</td>
<td></td>
<td>US$ 50 000</td>
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<tr>
<td>• Environmental Impact of the oily discharges on the environme</td>
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<tr>
<td>Program</td>
<td>Objectives</td>
<td>Output</td>
<td>Activities</td>
<td>Responsibility</td>
<td>Priority and Estimated Initial Costs</td>
</tr>
<tr>
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<tr>
<td>nt into which they have been discharged over the years</td>
<td>of oily wastes into the environment</td>
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<tr>
<td>15. Transported goods</td>
<td>To develop procedures for responding to environmental emergencies/contingencies</td>
<td>Emergency preparedness and response plans</td>
<td>Develop plan</td>
<td>Concessionaire</td>
<td>HIGH US$ 20 000</td>
</tr>
<tr>
<td>Development and implementation of Emergency preparedness and response plan</td>
<td>To develop arrangements for more environmentally friendly arrangements for transporting copper concentrates</td>
<td>Environmentally friendly arrangements</td>
<td>Develop arrangements</td>
<td>ZRL management</td>
<td>HIGH</td>
</tr>
<tr>
<td>Development and implementation of more environmentally friendly arrangements for transporting copper concentrates. The mining companies should be persuaded to use sealed wagons for transporting copper concentrates</td>
<td></td>
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</tbody>
</table>

### 8.2 Institutional Responsibilities for Clean-up

ZRL (perhaps with the assistance of GRZ) will have to bear the responsibility for instituting clean-up measures. This is in line with the “polluter pays principle” embedded in the Environmental Protection and Pollution Control Act. The clean-up will have to be seen as a broad package of short and long-term measures. The major recommended clean-up measures are as outlined in the action plan and must include:
(a) the development and adoption of cleaner production practices leading to
waste minimisation, good housekeeping, pollution control at source,
segregation of wastes – where feasible, etc.
(b) Installation, operation and maintenance of basic pollution control
equipment, in particular, oil separators at appropriate locations
(c) Possible pumping out of at least the surface oil-water admixture from the
environment adjoining the central workshops and the loco shed; and
institution of other remedial measures
(d) Proper disposal of scrap metal and other solid wastes

Other remedial measures as outlined in the action plan should include long
term issues such as the development of an environmental policy and an EMS,
training, introduction of environmental monitoring programs; development
and implementation of site-specific health, environment and safety programs.
Other measures must include the acquisition of protective equipment and
accessories and carrying out environmental impact assessment studies. The
preparation of emergency preparedness and emergency plans will also have to
be considered as part of the “clean-up” package in the broad sense.

Whereas ZRL and GRZ will have to bear the responsibility, a number of
national agencies will need to be involved. These should include, for example,
the local authorities, the Environmental Council of Zambia, the Inspectorate of
Factories, the Department of Water Affairs, the Investment Center, the
Ministry of Environment and Natural Resources, the Ministry of Health and
the Department of Energy

8.3 Roles and Responsibilities for National Agencies in Monitoring and
Evaluation of Plan

<table>
<thead>
<tr>
<th>COMPONENT OF ACTION PLAN</th>
<th>MAJOR RELEVANT NATIONAL AGENCY</th>
<th>RESPONSIBILITY/ROLE OF AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Development of an environmental policy and an EMS</td>
<td>ECZ</td>
<td>Advisory, coordinating, regulatory</td>
</tr>
<tr>
<td>2. Introduction of Cleaner Production Practices</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>3. Installation, Operation and Maintenance of Pollution Control Equipment</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>4. Clean up of contaminated sites</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>5. Development and Implementation a solid waste program</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>COMPONENT OF ACTION PLAN</td>
<td>MAJOR RELEVANT NATIONAL AGENCY</td>
<td>RESPONSIBILITY/ROLE OF AGENCY</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>6. Training of Safety and Environment Inspectors in matters related to storage facilities</td>
<td>Dept of Energy</td>
<td>Ditto</td>
</tr>
<tr>
<td>7. Introduction of a Wastewater treatment and Effluent Quality Monitoring Program</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>8. Introduction of an Air Quality Monitoring Program</td>
<td>ECZ</td>
<td>Ditto</td>
</tr>
<tr>
<td>10. Acquisition and Provision of Appropriate Safety Attire for Staff</td>
<td>Inspectorate of Factories, ECZ, Ministry of Health</td>
<td>Ditto</td>
</tr>
<tr>
<td>11. Competence and Awareness Safety and Environment Training for All Staff</td>
<td>Inspectorate of Factories, ECZ, Training Institutions</td>
<td>Ditto</td>
</tr>
<tr>
<td>12. Environmental Studies and Groundwater Quality Monitoring</td>
<td>ECZ, Dept. of Water Affairs, Ministry of Environment and Natural Resources</td>
<td>Ditto</td>
</tr>
</tbody>
</table>
9. APPENDICES

9.1 Self Assessment and Gap Analysis Questionnaire

**Zambia Railways Environmental Assessment Study**
**Self Assessment and Gap Analysis Questionnaire**

1. General

The organisation has established an environmental management system (EMS) that meets the requirements of ISO 14001 or similar standard.
- Fully established and implemented
- Established and some requirements implemented

2. Environmental Policy

Top management has defined the organisation’s environmental policy.
- Yes
- No

The environmental policy is appropriate and considers the nature, scale and environmental impacts of the organisation’s activities, products and services.
- Fully appropriate
- Partially appropriate, with some aspects/impacts omitted
- Not appropriate

The environmental policy includes a commitment to continual improvement.
- Yes, fully
- Commitment to continual improvement in policy could be improved
- No commitment to continual improvement

The environmental policy includes a commitment to comply with applicable environmental legislation and regulations.
- Yes
- Yes, but commitment could be improved
- No

The environmental policy provides a commitment to comply with other requirements to which the organisation subscribes.
- Yes
- Yes, but commitment could be improved
- No

The environmental policy provides a framework for setting and reviewing environmental objectives and targets.
- Yes
- Yes, but framework could be improved
- No
The environmental policy is documented and implemented
- Both
- The policy is documented, but not fully implemented
- Neither

The environmental policy is maintained and communicated to all employees.
- Both
- Maintained, but communication efforts could be improved
- Neither

The environmental policy is available to the public
- Yes
- No

3. Planning

Environmental Aspects

There is procedure established and maintained to identify the organisation’s environmental aspects in order to determine which aspects have significant impacts on the environment
- Procedure exists
- Procedure could be improved
- Procedure does not exist

Significant aspects are considered when setting environmental objectives.
- Yes, all
- Some
- No, none

Information pertaining to significant aspects is kept up to date.
- Yes
- No

Legal and other requirements

A procedure has been established to identify and have access to legal requirements and other requirements to which the organisation subscribes that are directly applicable to environmental impacts. The procedure is current and is maintained.
- Yes, a procedure exists and is current
- A procedure exists but needs to be updated
- No, a procedure does not exist

Objectives and Targets

Objectives and targets have been established at each relevant function and level within the organisation.
- Yes, fully
- Partially, at some functions and levels, but not all
- No
Relevant legal and other requirements were considered when establishing objectives and targets.
- Yes
- No

Significant environmental aspects were considered when establishing objectives and targets.
- Yes, fully
- Partially
- No

Technological options, financial, operational and business requirements were considered when establishing objectives and targets.
- Yes, fully
- Partially
- No

Views of interested parties were considered when establishing objectives and targets.
- Yes, fully
- Partially
- No

The objectives and targets are consistent with the environmental policy.
- Yes, fully
- Partially
- No

The objectives and targets are consistent with the commitment to prevention of pollution.
- Yes, fully
- Partially
- No

**Environmental Management Programs**

There is established environmental management program for achieving environmental objectives and targets.
- Yes, fully established
- Partially established
- No

The environmental management program includes a designation of responsibility for achieving objectives and targets at each relevant function and level of the organisation.
- Yes
- Some responsibilities not designated
- No

The environmental management program includes the means and time frame by which the objectives and targets are to be achieved.
The environmental management program applies to new developments, new or modified activities, products and services, as appropriate.

- Yes, fully
- Partially
- No

4. **Implementation and Operation**

**Structure and Responsibility**

Roles, responsibility, and authorities are defined, documented and communicated.

- Yes, fully
- Partially
- No

Resources essential to the implementation and control of EMS are provided – including human resources and specialised skills, technology and financial resources.

- Yes, fully
- Partially
- No

Top management has appointed a specific management representative(s) with defined roles, responsibilities and authority for establishing, implementing and maintaining the EMS

- Yes
- Some representatives not appointed
- Some roles, responsibilities and authorities not defined
- No

These representatives report to top management the performance of the environmental management system for management review and as a basis for continual improvement.

- Yes, on a scheduled basis
- Sometimes, but not on a scheduled basis
- No

**Training, Awareness and Competence**

Training needs have been identified and appropriate personnel have received necessary training.

- Yes, fully
- Partially
- No
Procedures are established and maintained to make employees aware of the importance of conformance with the environmental policy and procedures and with the requirements of EMS.

- Yes, full
- Partially
- No

Procedures are established and maintained to make employees aware of the significant impacts, actual or potential, of their work activities and the environmental benefits of improved personal performance.

- Yes, procedures are established and maintained
- Procedures could be improved
- No

Procedures are established and maintained to make employees aware of their roles and responsibilities in achieving conformance with environmental policy and with requirements of EMS – including emergency preparedness and response requirements.

- Yes, procedures are established and maintained
- Procedures could be improved
- No

Procedures are established and maintained to make employees aware of the potential consequences of nonadherence to operating procedures.

- Yes, procedures are established and maintained
- Procedures could be improved
- No

Personnel who perform tasks that may cause significant environmental impacts are competent to perform their duties based on education, training and experience.

- Yes, fully competent
- Partially competent
- No

Communication

Procedures are established and maintained for internal communication about significant environmental aspects of the EMS.

- Yes procedures are established and maintained
- Procedures could be improved
- No

Procedures are established for receiving, documenting and responding to relevant communication from external interested parties as it relates to significant environmental aspects and the EMS.

- Yes, procedures are established and maintained
- Procedures could be improved
- No
Means for externally communicating information about significant environmental aspects have been considered and documented.

- Yes, fully reviewed and documented
- Reviewed, but not documented
- No

**Environmental Management System (EMS) Documentation**

Information describing the core elements of EMS is established and maintained.

- Yes, fully
- Partially
- No

**Document Control**

Procedures for controlling all documents are established, maintained and readily available.

- Yes, procedures are established, maintained and readily available
- Procedures established, but not readily available
- Procedures could be improved
- Procedures not established

These procedures are periodically reviewed, revised if necessary, and approved by authorised personnel.

- Yes, procedures are periodically reviewed and revised
- Procedures are reviewed and revised, but not on any specific schedule
- No, procedures are not reviewed

Current versions of relevant documents are available and in their proper locations for effective functioning of the EMS.

- Yes, fully
- Partially
- No

Obsolete documents are promptly removed from all areas using these documents.

- Yes
- No

Obsolete documents retained for legal or knowledge preservation purposes so marked

- Yes
- No

Documents are legible, dated and readily identifiable

- Yes
- No

There are procedures and responsibilities established and maintained for creating and modifying pertinent documents

- Yes, procedures are established and maintained
- Procedures could be improved
Operational Control

Operations and activities that are associated with significant environmental impacts and which fall within the scope of the environmental policy, objectives and targets have been identified.

- Yes, fully
- Partially
- No

Procedures pertaining to these activities are established and maintained to cover situations that, in their absence, might lead to deviations from the environmental policy and the objectives and targets.

- Yes, procedures are established and maintained
- Procedures could be improved
- No

Procedures stipulate operating criteria

- Yes
- No

Procedures related to the significant environmental aspects of goods and services from suppliers and contractors are established and maintained.

- Yes, procedures are established and maintained
- Procedures could be improved
- No

Relevant procedures and requirements are communicated to suppliers and contractors

- Yes, fully
- Partially
- No

Emergency Preparedness and Response

Procedures that identify the potential for and the response to accidents and emergency situations are established and maintained

- Yes, procedures are established and maintained
- Procedures could be improved
- No

The procedures address prevention and mitigation of environmental impacts that may be associated with any accidents or emergency situations

- Yes, fully
- Partially
- No

Emergency preparedness and response procedures are reviewed and revised as necessary, but in particular after the occurrence of accidents or emergency situations

- Yes
Emergency preparedness and response procedures are periodically tested where practicable
☐ Yes
☐ No

5. Checking and Corrective Action

Monitoring and Measurement

There are procedures established and maintained to monitor and measure on a regular basis the key characteristics of the operations and activities that can have a significant impact on the environment
☐ Yes, procedures are established and maintained
☐ Procedures could be improved
☐ No

Monitoring and measurement includes recording information to track performance, relevant operations controls and conformance with objectives and targets
☐ Yes, fully
☐ Partially
☐ No

Monitoring equipment is calibrated and maintained and a record of calibration process is retained, per procedure.
☐ Yes
☐ No

A procedure is established and maintained to periodically evaluate compliance with relevant environmental legislation and regulations
☐ Yes, a procedure is established and maintained
☐ Procedures could be improved
☐ No

Nonconformance and Corrective and Preventive Action

Procedures are established and maintained for handling and investigating nonconformance, for taking action to mitigate the impacts caused by nonconformance, and for initiating corrective and preventive action.
☐ Yes, procedures are established and maintained
☐ Procedures could be improved
☐ No

Responsibility and authority for these same tasks are defined
☐ Yes, fully
☐ Partially
☐ No
Any corrective or preventive action is appropriate for the magnitude of actual or potential environmental impact that has or could occur from nonconformance

☐ Yes
☐ No

Procedures are modified to reflect corrective and preventive action

☐ Yes, fully
☐ Partially
☐ No

Records

Procedures are established and maintained for the identification, maintenance and disposition of environmental records.

☐ Yes, procedures are established and maintained
☐ Procedures could be improved
☐ No

Environmental records include training records, records of audit results and records of management reviews

☐ Yes
☐ No

Environmental records are legible, identifiable and traceable to the activity, product or service involved.

☐ Yes
☐ No

Environmental records are easily retrievable and are protected from damage, deterioration or loss

☐ Yes
☐ No

The retention history of the records is documented

☐ Yes
☐ No

The records demonstrate compliance with the standard

☐ Yes, fully
☐ Partially
☐ No

Environmental Management System(EMS) Audit

A program and procedures are established and maintained for periodic EMS audits.

☐ Yes, a program and procedures are established and maintained
☐ The program and procedures could be improved
☐ A program and procedures have been established
The audits determine whether or not the EMS conforms to specified internal requirements for environmental management, including conformance to the requirements of the standard
- Yes, fully
- Partially
- No

The audit determine whether or not the EMS has been properly implemented and maintained
- Yes, fully
- Partially
- No

The audit results are presented for management review.
- Yes
- No

The audit procedures cover the audit scope, frequency and methodologies, and responsibilities and requirements for conducting audits and reporting results.
- Yes, fully
- Partially
- No

6. Management Review

Top management periodically reviews the EMS to ensure continuing suitability, adequacy and effectiveness.
- Yes, on a scheduled basis
- Sometimes, but not on a regular basis
- No

Necessary information is collected and provided to allow management to carry out the evaluation
- Yes, fully
- Partially
- No

Management assesses the need for changes in environmental policy, objectives, and in the EMS, as indicated by EMS audit results, changing circumstances, and the commitment to continual improvement
- Yes, fully
- Partially
- No

END
9.2 Staff Consulted/Interviewed at ZRL

1. Mr. R.G. Crawford – Managing Director, ZRL
2. Mr. N.K.J. Nyirenda – Manager, Safety and Environment, ZRL
3. Ms. H.M. Mukumba – Manager, workshops, ZRL, Central workshops (CW)
4. Mr. G. E. Lungu – Engineer, Motive Power, ZRL, Central Workshops
5. Mr. A. Tembo – Engineer, Production and Plant Maintenance, ZRL, CW
6. Mr. J.K. Phiri – Engineer, carriage and Wagons, ZRL, CW
7. Mr. G. Mwanza – Superintendent, Carriage and Wagons, ZRL, CW
8. Mr. H. Mizinga – Safety and Environment Inspector, ZRL, CW
9. Mr. L. Kalaluka – Foreman, Loco shed, ZRL, CW
10. Mr. Gondwe – Foreman, Motor vehicle repair workshop, ZRL
11. Mr. J. Chishiba – Acting Chief Inspector, Environmental Council of Zambia
12. Mr. F. Mangimela, Safety Inspector (Operations), ZRL, Kitwe
13. Mr. Lungu, Station Master, ZRL, Kitwe
9.3 Documents Consulted

2. Zambia Railways Limited – General Information and Statistics
3. Zambia Railways – We Are On the Right Track
4. Zambia Railways Safety Rules
5. Train Accident Investigation Guide – Zambia Railways
6. Operating Rules – Zambia Railways
7. Operating Rules Appendix – Zambia Railways
8. Accident Prevention and General Safety Practice – Zambia Railways
9. Company Policy for Safety and Health at Work – ZRL
10. SADC Hazardous Materials Handbook
9.4 Schematic Layout of the ZRL Central

- Water Storage Tanks
- C&W STORES
- WHEEL PARK
- CARPENTRY
- MILLRIGHT
- PAINTSHOP
- ADMIN BLOCK
- SAWMILL
- FAB.
9.5 ZRL Track Work Details