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ENVIRONMENTAL ASSESSMENT REPORT

NIEC Farms Limited Facility
Farm 2029, Lusaka Rural
Central Province, Zambia
Date Assessed : April 19, 1995

Prepared for the
ZAMBIA PRIVATISATION AGENCY

Prepared by
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June 15, 1995

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1. INTRODUCTION

An environmental assessment was conducted by PH Associates, Inc. on NIEC Farms Limited (NIEC Farms) facility, Zambia. The purpose of the assessment was to determine whether air, soil, surface water, or groundwater has been potentially affected at the facility site by current or past site activities or processes, and to provide information concerning potential environmental liabilities. This assessment was based on Ministry reviews and interviews, review of applicable environmental regulations, aerial photographs, facility records, interview of site personnel, and an onsite/offsite reconnaissance of the property.

This report has been prepared for the Zambia Privatisation Agency (ZPA) pursuant to a contractual agreement between the U S Agency for International Development (USAID) and PH Associates, dated March 16, 1995. The report is based on limited documented information and interviews with available facility personnel, is accurate to the best of PH Associates knowledge and belief, and has been prepared for the exclusive use of ZPA for specific application to the above-referenced facility. No warranty, expressed or implied, is made. In the event of any changes in the nature, design or locations of the facility site or structures, the conclusions and recommendations in this report should not be considered valid unless the changes are reviewed and the conclusions are verified in writing by PH Associates. This report should not be construed to be a legal representation or interpretation of environmental laws, rules, or regulations.

1.1 Background

As part of a preliminary information gathering activity in 1992, the ZPA distributed a questionnaire requesting disclosure of specific company and site information that would be relevant to completing the environmental assessment. The questionnaire was not returned.

Additional environmental data was requested by PH Associates in the form of a questionnaire submitted to the facility during June and July 1994. The purpose of the PH Associates questionnaire was to obtain information that was either not available at the time, or to supplement information not fully detailed in the returned ZPA questionnaire. The additional data was obtained by distributing an extensive environmental survey questionnaire to facility management, and requesting their cooperation in completing and returning the survey form. The questionnaire was not returned.

NIEC Farms facility is located approximately 35 kilometers northeast of Lusaka in the Central Province (Section 7, Figure 1). The site address is Farm 2029 in Lusaka Rural, Central Province, and the facility is surrounded by agricultural land (Section 7, Figure 2). Within a 1 kilometer radius of the NIEC Farms facility predominantly there are farms (Section 7, Figure 1).

NIEC Farms has a total of 3,043 acres of land presently idle pending privatisation. When operational, NIEC Farms raised cattle and poultry and sold livestock to be slaughtered offsite. Farm activities included pesticides (fungicides) and insecticides spraying and cattle dipping, poultry houses maintenance, maize and small household gardens grown for NIEC Farms staff consumption, and farm vehicle and car maintenance.

2. SCOPE OF WORK

PH Associates performed an environmental assessment of the facility to assess and document potential adverse environmental effects on air, soil, surface water, and groundwater that might have resulted from either current or past activities on the site. This assessment was qualitative, based on readily available existing information, interviews and field observations. It did not involve environmental field testing or sampling, laboratory analyses, or an asbestos survey.

In general, PH Associates staff endeavored to:

- Conduct interviews with Ministry personnel and other pertinent organizations to assess the current state of environmental affairs and regulations.
- Review available Ministry reports on past facility inspections and geologic and hydrogeologic data.
- Evaluate existing environmental regulations that are applicable to assessing potentially adverse effects on air, soil, surface water and groundwater.
- Review available facility files to investigate past or current activities on the site with respect to environmental permits and compliance, wastewater, site drainage, and air emissions; and handling, storage, treatment, and disposal or spills of potentially hazardous materials and wastes.
- Review readily available aerial photographs of the site and adjacent properties. In addition, PH Associates reviewed available drawings of the site showing facility layout, underground piping, buried tanks, utilities and site drainage systems.
- With the consent of the site management, perform an onsite field reconnaissance of the facility. During the field reconnaissance, PH Associates looked for evidence of releases of potentially hazardous chemicals, petroleum products, or process wastes to the soil, surface water, and groundwater by spilling, dumping, burning or burial of materials.
- Perform a field reconnaissance of the area, within approximately 1 kilometer radius of the facility, that was feasible within the level of effort identified for this contract. During the field reconnaissance, PH Associates attempted to identify neighboring commercial and industrial sites that may potentially adversely affect the environmental conditions at the facility.
- Interview available staff who were knowledgeable of current and past site activities and processes at the facility and of surrounding properties.
- Document the findings and observations of the visited site with photographs. Copies of these photographs are included in Section 8 of this report.
- Prepare an Environmental Assessment Report presenting the areas of environmental concerns, results of the Ministry records, applicable environmental regulations, aerial photograph reviews, site visits and personnel interviews, and provide conclusions and recommendations for submission to USAID and ZPA.

3. METHODOLOGY

This section presents the methodology used to complete the scope of work for the environmental assessment project. Methods used include a review of the ministry records, environmental regulations, aerial photographs, facility records, ministry and facility personnel interviews, and site visits. Results of the assessment are presented in Section 4.0, and the conclusions and recommendations are presented in Section 5.0.

3.1 Ministry Records Reviews and Interviews

PH Associates interviewed Ministry personnel and other pertinent organizations to discuss the current state of environmental affairs and regulations in Zambia. Ministry records, such as factory inspections, geologic and hydrogeologic reports, were also obtained and reviewed for the sites to be assessed.

The following Ministries personnel and other pertinent organizations were interviewed and the results of these discussions are included in Appendix C.

Environmental Council of Zambia

Mr Julius Kanyembo, Director - April 13, 1995

Mrs I Mbewe, Legal Officer - April 24, 1995

Ministry of Energy and Water Development, Water Affairs

Mr Stan Chisala, Senior Engineer - April 18, 1995

Ministry of Labor and Social Security, Chief Inspector of Factories

Mr K Mapani, Chief Inspector of Factories - April 20, 1995

Mr Kakoma Chivundu, Inspector of Factories - April 28, 1995

Mr Lukwesa, Inspector of Factories - April 28, 1995

Ministry of Mines and Minerals Development, Geological Survey Department

Mr O Ng'ambi, Acting Director - April 24, 1995

Mr Clement Namateba, Senior Geologist (PGR) - April 24, 1995

International Bank for Reconstruction and Development (World Bank)

Mr Gedion Nkojo, Resident Representative - April 24, 1995

Mr Julius Chileshe, Natural Resource Economist - April 24, 1995

3.2 Environmental Regulations

Legislative Policies, Acts, and Regulations enacted by Zambia were reviewed for their applicability to completing environmental assessments of the facilities identified by the ZPA. The purpose of the review was to evaluate and summarize those guidelines pertaining to environmental issues which industries in Zambia are required to adhere. A summary of the environmental regulations for Zambia is presented in Appendix D, Table 1. Twelve regulations were selected for review based on their potential applicability to the assessed sites. Six of these regulations contained applicable environmental laws addressing air, soil and water pollution and include:

- Water Act of 1949
- Environmental Protection and Pollution Control Act of 1990
- Water Pollution Control Regulations of 1993
- Waste Management Regulations of 1993
- Mining (Dumps) Regulations of 1972
- Mines and Minerals Act of 1976

The applicable regulations or laws used to evaluate environmental compliance of the facilities assessed are summarized in Table 2 of Appendix D. Only recently have regulations addressing the protection of human health and the environment in any detail been enacted. Prior to the passing of the Environmental Protection and Pollution Control Act of 1990 and the establishment of the Environmental Council of Zambia, legislation mostly addressed issues of worker health and safety.

Currently, no guidelines have been implemented by the Environmental Council of Zambia defining specific materials or chemicals as hazardous. Application of the term "hazardous" is generally based on specific characteristics of a substance or constituent such as ignitability, corrosivity, reactivity, and toxicity. Depending on the concentration of the constituent in sludges, soil, surface water, or groundwater, the constituent may or may not be considered hazardous.

Since Zambia has not developed hazardous chemicals guidelines, PH Associates applied fourteen programs adopted by the United States Environmental Protection Agency (EPA) and State Governments that identify substances as either hazardous, extremely hazardous, toxic or carcinogenic. The California EPA May 1992 Chemical Cross-Index reference tabulates all the hazardous chemicals and compounds listed in these programs and was used by PH Associates to assess whether substances found during the assessments were potentially hazardous.

3.3 Aerial Photographs

On April 12, 1995 the Mapping Services Section of the Survey Department was visited by PH Associates to review any available and applicable aerial photographs of the sites to be assessed. The aerial photographs were reviewed to identify possible changes in structures, topography, site activities, processes, and waste disposal practices that could be used as additional information to the current site conditions observed during PH Associates visit.

Review of the aerial photographs from the Survey Department indicated that the photographs and any enlargements are at a scale where ground objects are much too small to provide any useful information or details of the sites. Aerial photographs were available at a scale of 1:30,000 and enlargements at a scale of 1:7,500. Based on PH Associates past experience it was determined that no applicable information would be gained from use of aerial photographs at this scale.

3.4 Facility Site Reviews

Site reviews were conducted by PH Associates and included site visits, analysis of facility records and facility personnel interviews.

3.4.1 Site Visits

PH Associates conducted a field reconnaissance of the site focusing on identifying site activities and practices that have or may have potential environmental effects in the future. An Environmental Assessment Checklist survey form was completed during the field reconnaissance and is attached in Appendix E. The Location Map and Site Plan for the facility are attached in Section 7. Photographs of the field observations taken during the site visit are included in Section 8.

A field reconnaissance of the area within approximately 1 kilometer radius of the facility was also performed to identify neighboring industries that may potentially adversely affect the environmental conditions at the facility. The offsite reconnaissance, that was feasible for the contracted level of effort, involved interviews with facility personnel and a drive-by of the surrounding area. No offsite industries were contacted or visited by PH Associates.

3.4.2 Facility Records

Facility records and aerial photographs applicable to completing the environmental assessment were requested from the facility. Records requested included documents containing information and details on building and structure designs, underground storage tanks, process flow diagrams, process materials and wastes, waste disposal, environmental permits, monitoring programs and controls, and documentation on storage or use of potentially hazardous materials. These records, if made available to PH Associates, are attached in Appendix F.

3.4.3 Interviews

Interviews were conducted with available facility personnel, usually site managers, who could provide information on past or current site activities and processes, potentially hazardous materials use and storage, spills, accidents, utilities, fuel storage areas, maintenance practices, waste disposal, permits, monitoring programs, and laboratory analyses.

4. RESULTS OF ENVIRONMENTAL ASSESSMENT

The results of the environmental assessment are presented below and include the following sections: Facility Ministry Records/Site Aerial Photographs/Facility History and Records/Site Activities and Processes/Environmental Setting/Field Reconnaissance Results and Applicable Environmental Regulations.

4.1 Facility Ministry Records

No Ministry records specific to this site were available during the Ministry records review and interviews.

4.2 Aerial Photographs

An aerial photograph provided by NIEC Farms during PH Associates visit is included in Appendix F.

4.3 Facility History and Records

On April 19, 1995, Ms Elena Pomar of PH Associates interviewed Mr Arnold Kaoma, General Manager of the NIEC Farms facility, and Mr John Chipompwe, Accountant. The purpose of the interview was to obtain information on NIEC Farms site history, facility layout, products, services, and available facility records. The Site Assessment Checklist for NIEC Farms site is provided in Appendix E.

A Facility Site Plan for NIEC Farms is shown in Section 7, Figure 2. From October 1990 to January 1995, the farm operated as a livestock producer. Prior to that, according to Mr Kaoma, the current manager, the site was used for tobacco and maize farming.

The following facility records were available for review by PH Associates and are attached in Appendix F:

- Facility Site Plan from Land Survey Ordinance Records, April 1957
- Aerial Photograph (scale 1:30,000)

According to the NIEC Farms management the facility does not have any environmental or operation licenses.

Mr Kaoma indicated that since October 1990, the cattle and poultry were sold off during a four year period, and in January 1995 the farm ceased operations pending privatisation.

4.4 Site Activities and Processes

NIEC Farms has a total of 3,043 acres and was, when operational, a livestock cattle and poultry farm. In October 1990 it was fully operational with 2,000 head of cattle and approximately 14,000 chickens. The livestock was sold off over a four year period.

4.5 Environmental Setting

The environmental setting of the NIEC Farms facility including topography, geology and hydrogeology is detailed below.

4.5.1 Topography

The topography of the area consists of gently sloping land at an elevation approximately ranging from 1,100 to 1,130 meters above mean sea level. The Chongwe River and its tributaries generally surround NIEC Farms producing seasonal swamps or dambos which provide fertile soil deposits in the areas along the rivers. The Chongwe River borders NIEC Farms to the East of the farm (See aerial photograph in Appendix F).

The surrounding area has a well developed radial drainage pattern centered at Chikumbi, 12 kilometers southwest of NIEC Farms. Surface water at the site generally flows toward the Chongwe which eventually flows southeast to the Zambezi River, one of the major rivers of Zambia.

4.5.2 Geology

The surficial geology of the area consists of Young Quarternary dambo or marsh deposits predominantly clay and silt and sandy overbank river deposits of varying thickness. Residual (laterite) surface soils are located in those areas not affected by dambos or by river leposits.

The underlying bedrock is complex and consists of highly faulted and sheared gneiss of the Mpande Formation (Thieme, 1983). Younger quartzite units of the Mulola Formation sporadically outcrop in a linear pattern throughout the surrounding area. The Mpande formation gneiss is part of the Precambrian Basement Complex. The younger Mulola quartzites are part of the PreCambrian Muva Supergroup (Thieme, 1983). These formations were uplifted, folded, faulted, and eroded during several major orogenic (uplift) events, with the latest occurring approximately 460 million years ago (Thieme, 1983). These events have formed the existing high plateau peneplain characteristic of Central Zambia.

4.5.3 Hydrogeology

The Chongwe-Chalimbana basin form a radial drainage pattern controlled by the complex structural geology of the bedrock (NRGS, 1963-detail on Section 7, Figure 3). Surface water drains through laterite units into the groundwater. Laterites can form perched water tables during the dry season. The streams originating from some spring lines are more persistent, but also dry up as the water table falls toward the end of the dry season. A dambo, or seasonal marsh, forms to the eastern side of NIEC Farms during the rainy season, as stated by the management.

NIEC Farms is obtained from two existing boreholes on the property. One borehole (#1) is located near the Manager's house at a depth of 25 meters and has dried up. Borehole #2 is located at a depth of 30 meters approximately 17 kilometers northeast of the cattle dip bath and presently produces 10,000 liters of water per day, a yield 25 % lower than it originally produced in 1990.

Surface water eventually flows in an easterly direction to meet the Chongwe River which borders NIEC Farms on the East side of the property (Aerial Photograph, Appendix F). The presence of dambos or marshes and in part, the groundwater flow, is seasonally controlled (by the rainy or dry season) by the Chongwe and small tributaries found on NIEC Farms (Aerial Photograph, Appendix F).

4.6 Field Reconnaissance Results

On April 19, 1995, a tour of the facility was provided by Mr Kaoma and Mr Chipompwe, and past activities were discussed. During the tour, past activities at NIEC Farms were discussed with PH Associates. Results of the field reconnaissance and interview with NIEC Farms personnel are presented in this section.

4.6.1 Utilities

The following is a summary of the utilities that service the NIEC Farms facility.

4.6.1.1 Electricity

Zambia Electricity Supply Corporation Ltd (ZESCO) provides electricity to NIEC Farms. Electrical transformers are owned and operated by ZESCO and are located on NIEC Farms property (see Section 8, Photograph 1). According to NIEC Farms staff no transformer oil spills have occurred. ZESCO inspects the transformers every three months.

4.6.1.2 Water Supply

NIEC Farms water supply is obtained from two existing boreholes on the property. One borehole (#1) is located near the Manager's house (Section 8, Photograph 2) at a depth of 25 meters. The second borehole (#2) is located at a depth of 30 meters, 1.7 kilometers northeast of the cattle dip bath (Section 7, Photograph 2 and Section 8, Photograph 3). Borehole #1 when in operation produced between 5-10,000 liters of water per day, but has been inactive since 1993. Borehole #2 presently produces 10,000 liters of water per day, although yield has fallen by approximately 25% since 1990.

NIEC Farms Management is concerned that the active borehole will dry up, with the result that the remaining employees and their families will have no alternative source of domestic water. Vegetable and maize crops have already been abandoned due to the scarcity of water supply.

4.6.1.3 Sanitary Sewer

One leach field exists near the Manager's house but Mr Kaoma had no information on size, construction specifications, or installation date of the field. The leach field area has not been cleared or changed since NIEC Farms took over in October 1990.

The workers houses (Section 7, Figure 2), located in a compound near the southeast area of the property do not have leach field/septic tank facilities, but instead use pit latrines (Section 8, Photograph 4). When the pit latrines are filled, the structure is abandoned and a new one built.

4.6.1.4 Stormwater Control

There is presently no stormwater control at NIEC Farms. When heavy rains occur during the rainy season, dambos or seasonal swamps form, as mentioned in section 4.5.3 of this report.

Stormwater runoff containing fertilizers used in the adjacent farms could potentially adversely affect the groundwater at NIEC Farms.

4.6.2 Structures

Structures at the NIEC Farms facility are made of brick, concrete, steel, and some asbestos. According to Mr Kaoma, the main building was constructed approximately 20 years ago. Asbestos materials were observed in the poultry houses and may be present in other structures. The approximate location of each building is shown on the Facility Site Plan in Figure 2 and includes:

- Manager's House
- Vehicle Maintenance/Storage Building
- One Underground Leach Field
- Two Aboveground Concrete and Steel Water Tanks and Borehole #1
- Five Poultry Houses
- One Cattle Dip Bath
- Seventeen Houses in Farmworkers Compound
- Borehole #2
- Several Pit Latrines (at least four) in Farmworkers Compound

4.6.3 Environmental Effects and Observations

Observations made during the field reconnaissance and any potential environmental effects are discussed in the following sections.

4.6.3.1 Chemicals, Petroleum, and Process Materials

Materials used at NIEC Farms during its operation included approximately 620 tons/year of ready-made livestock feed.

Pesticides (fungicides) and insecticides were used in small quantities for hand-spraying on cattle. Less than 10 kilograms/year of pesticides (fungicides) and approximately 20 liters/year of insecticides were used for hand-spraying.

Cattle dips were applied to livestock as protection from fungi and insects during the rainy season. "SUPONA" and "DELTAMETHRINE" were used for dipping the cattle in the dip bath (Section 8, Photograph 3). "SUPONA" contains chlorfenvinfos and approximately 500 liters/year were used. "DELTAMETHRINE" which contains pyrithroid was used in small quantities of 10 liters/year.

Lubricating and hydraulic oils have been used at the vehicle maintenance/workshop area (Section 7, Figure 4 and Section 8, Photographs 5 & 6). When the farm operated as a tobacco and maize producer, several trucks were maintained. There was evidence of oil stains in both the roofed and open area of the maintenance workshop. Only two cars were presently being serviced at the workshop.

High concentrations of fertilizers and possibly other chemicals were improperly applied when the farm operated as a tobacco and maize

producer, as evidenced by soil discoloration and scant vegetation in certain areas.

4.6.3.2 Process Waste Streams

Although NIEC Farms was not operational at the time of PH Associates site visit, the interview with farm management confirmed some of the waste streams from past activities could be traced through the residual structures, chemicals and equipment found on the farm.

The sanitary waste, as described above goes directly into the ground through a leach field at the Manager's house and directly into pit latrines at the farmworkers compound.

Since the cattle dip baths are open-air structures, it is possible during heavy rains, that the contents overflowed. Although management did not state that this had happened in the past, an inspection of the area indicated the depth of the dip bath was shallow enough for overflowing to have occurred (Section 8, Photograph 3). It was also possible that some seepage from the concrete bath into the ground below could have potentially occurred.

Recent use of pesticides (fungicides) and insecticides during the operation period of NIEC Farms could have washed waste from animals and vegetation, potentially leaching into the groundwater table.

Fertilizers and possibly other chemicals were improperly used (over applied) at the farm as evidenced by acres with scant vegetative growth.

During operational times, solid waste from the poultry operation was recycled as fertilizer and partly used for feed in the livestock operation.

Sanitary solid waste from the pit latrines remains within these structures, and with time, there is the possibility of potential adverse effects to the subsurface soils and groundwater.

Solid waste in the form of scrap metals and tires from the vehicle maintenance area (Section 8, Photograph 9), have remained from the previous ownership of NIEC Farms. The solid waste currently generated from the office and residences, is burned at the farm.

4.6.3.3 Air Emissions

Hand-spraying of pesticides and insecticides could have caused a localized potentially adverse environmental problem in the vicinity of the cattle spraying area. Equipment stored in the farm office/storage area adjacent to the vehicle maintenance area indicate hand-held equipment to have been used (Section 8, Photograph 10). There was probably a limited area to have been affected by this spraying operation.

Air emissions from the burning of office and household waste could present a potentially adverse environmental problem at NIEC Farms.

4.6.3.4 Pesticide/Herbicide Use

Pesticides (fungicides) and insecticides sprayed on cattle were used in a limited amount at NIEC Farms. Not more than 10 kilograms of pesticides and 20 liters of insecticides were used per year. No brand name or chemical contents of these pesticides/insecticides were available from management.

Dip baths for cattle utilized approximately 500 liters/year of "SUPONA", 20 liters/year of "DELTAMETHRINE" at NIEC Farms for prevention of fungi and insects during the rainy season.

4.6.3.5 Potentially Hazardous Materials

Currently, no guidelines have been implemented by the Environmental Council of Zambia defining specific materials or chemicals as hazardous. Application of the term "hazardous" is generally based on specific characteristics of a substance or constituent such as ignitability, corrosivity, reactivity, and toxicity. Depending on the concentration of the constituent in sludges, soil, surface water, or groundwater, the constituent may or may not be considered hazardous.

Materials onsite such as pesticides and insecticides, petroleum products, past fertilizer use, and stormwater runoff may potentially contain specific constituents at levels that could be identified as hazardous and regulated once guidelines are enacted. Applying regulations adopted by the United States Environmental Protection Agency the constituent chlorfenvinfos from the cattle dips is listed as an "extremely hazardous substance". Other materials listed above could potentially pose a threat to human health and the environment, based on ignitability, toxicity, and human carcinogenic risk (CAL EPA, 1992).

Asbestos found in the construction of the poultry houses is also hazardous and known to produce lung cancer in individuals who experience prolonged exposure.

4.6.3.6 Waste Disposal

Liquid wastes produced at NIEC Farms consist of:

- insecticides and fungicides used in the dip bath

Solid wastes produced at the farm include:

- sanitary waste
- tires and scrap metal from the vehicle maintenance area
- used oil from vehicle maintenance and
- miscellaneous solid waste such as office, household and packaging.

Sanitary waste from the pit latrines goes directly into the ground and could have an adverse effect on the subsurface soil and the groundwater table. The Chongwe River is located within close proximity to the pit latrines in the farm workers compound (Section 7, Figure 2).

The scrap metal is stockpiled onsite about 1/2 kilometer from the Manager's house. During the recent April 14, holiday weekend, there was a fire in this area of solid waste disposal (Section 8, Photograph 11).

Office and household wastes are deposited on the bare ground near the scrap metal stockpile and the farmworkers compound until they are burned. Potential leaching could occur into the groundwater from these wastes. Used oil from the vehicle maintenance is re-used by the farm workers. Management indicated no used oil is disposed of.

4.6.3.7 Underground/Aboveground Storage Tanks

According to Management. no underground storage tanks (USTs) are located at NIEC Farms. Management indicated that many vehicles, trucks and farm machinery were used in past operations when the farm was growing tobacco and maize. It appeared that these vehicles could have been fueled at the premises, although there was no known location for any UST.

NIEC Farms operate two 5,000 gallons aboveground water storage tanks (AST) containing water (Section 8, Photograph 2).

4.6.3.8 Releases/Spill Controls

No spills/releases were reported by NIEC Farms. Areas of scant vegetation and soil discoloration were observed on the eastern side of the farm, in close proximity to the Chongwe River (Section 7, Figure 2), indicating potential high fertilizer/chemical over-application to soils. According to management, no vegetation has been observed growing in these areas for ten years.

Releases of pesticides (fungicides and insecticides from cattle dipping and spraying and petroleum from the vehicle maintenance/workshop area could potentially have adversely affected soils and shallow groundwater in these areas (see also Section 4.6.3.6)

4.7 Applicable Environmental Regulations

A summary of the applicable environmental regulations for Zambia is presented in Table 2 of Appendix D. Based on review of these regulations, the NIEC Farms facility is:

- illegally discharging wastewater (from stormwater runoff) from the vehicle maintenance/workshop area and pesticides, fungicides, insecticides, from the cattle dipping and spraying area, directly onto ground
- illegally burning wastes onsite

The Water Pollution Control (Effluent and Wastewater) Regulations of 1993, require a license to discharge wastewater that may pollute the environment. The conditions of the license include discharge record keeping, weekly sampling and testing of the wastewater, and submission of a bi-annual report to ECZ. The discharged wastewater must meet the standards (limits) for parameters listed in Table 3 of Appendix D. In addition, the discharger has 12 hours to report any abnormal wastewater discharges (above limits) to ECZ.

Pursuant to the Environmental Protection and Pollution Control act of 1990, it is illegal to dump waste anywhere but at a licensed disposal facility.

5. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are presented addressing areas of environmental concerns at the NIEC Farms facility based on the findings of the environmental assessment.

- Chemicals used in the cattle dip baths could adversely affect the surface soil, subsurface soil and groundwater conditions in the immediate area if an overflow occurred.
- Fertilizers and/or chemicals have been applied/spilled in heavy concentrations at various locations around the facility. As a result, surface soil, subsurface soil and groundwater conditions beneath these areas may have been adversely affected.
- Surface runoff containing oils or lubricants from the vehicle maintenance area may potentially adversely affect offsite soil, surface water and groundwater quality.
- Wastewater from the unmaintained leach field contains nitrates which could potentially adversely affect groundwater conditions.
- Pursuant to the Water Pollution Control (Effluent and Wastewater) Regulations of 1993, surface water runoff and wastewater containing chemicals were being illegally discharged. As a result surface soil and groundwater quality may potentially be adversely affected in the area.
- The disposal of solid wastes in pits at NIEC Farms may potentially adversely affect surface and subsurface soils and groundwater quality.
- Pesticides (fungicides) and insecticides were used in limited amounts at NIEC Farms. Depending on the amounts used they may have potentially adversely affected surface soil, subsurface soil and groundwater conditions at the farm.
- Transformer oils at the facility may potentially contain polychlorinated biphenyls (PCBs). No testing for PCBs has been performed
- According to NIEC Farms management, asbestos has been used in the construction of the poultry houses. Asbestos is a known human carcinogenic.
- NIEC Farms lacks an environmental safety and procedures plan detailing storage, handling, cleanup, and disposal procedures for the chemicals used at the facility.
- Based on the field reconnaissance of the area surrounding the facility, neighboring farms were identified by PH Associates as possible facilities that may potentially adversely effect the environmental conditions at NIEC Farms due to their high use of fertilizers, pesticides and herbicides.

PH Associates recommends that

- NIEC Farms investigate soil quality at the cattle dip areas, unvegetated soil areas, the vehicle maintenance area, and the wastepit areas. This investigation should include collecting soil samples to obtain the concentration of chemicals and petroleum in the soil. If significant levels are found, a groundwater investigation should also be conducted.
- NIEC Farms request ZESCO to analyze oils from the facility transformers for polychlorinated biphenyls (PCBs). If PCBs are found, SBC should obtain ZESCO's Environmental Safety and ~~PCB Mitigation Plan for Transformers (PCBs), that detail ZESCO's responsibilities and plan-of-~~ action should a PCB oil spill occur.

- NIEC Farms secure a site plan from historical records, if available, to investigate the possibility of an underground storage tank (UST), which could have been used to refuel vehicles under the previous farm ownership.
- NIEC Farms conduct an asbestos survey and implement an asbestos abatement plan at the facility. Storage of drums containing asbestos should be secured.
- NIEC Farms develop and implement an environmental safety and procedures plan detailing storage, handling, monitoring, cleanup, and disposal procedures for the facility, emphasizing the proper use for dip chemicals.
- NIEC Farms maintain inventory and waste disposal records specifically listing the types and quantities of chemicals, oils, and materials brought onsite and the types and quantities of materials recycled or disposed of and their disposal locations. This "cradle-to-grave" tracking of materials should be incorporated into the environmental safety and procedures program.
- NIEC Farms implement an environmentally sound septic tank maintenance program, and replace the pit latrines with bathrooms and septic tank facilities at the farmworkers compound.
- NIEC Farms dispose of wastes offsite at an appropriate facility

6. REFERENCES

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Chemical Cross-Index, May 1992

CHIPOMPWE, J

Accountant, NIEC Farms, Farm 2029, Lusaka Rural, Central Province, Zambia, Personal Interview, April 19, 1995.

GOVERNMENT OF ZAMBIA

The Environmental Protection and Pollution Control Act, No 12 of 1990

GOVERNMENT OF ZAMBIA

The Mines and Minerals Act, 1976, Chapter 329 of the Laws of Zambia

GOVERNMENT OF ZAMBIA

The Mining (Dumps) Regulations, 1972, Chapter 329 of the Laws of Zambia, Section 132

GOVERNMENT OF ZAMBIA

The Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 - Statutory Instrument No 71 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA

The Water Pollution Control (Effluent and Wastewater) Regulations, 1993 - Statutory Instrument No 72 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

KAOMA, A

Farm Manager, NIEC Farms, Farm 2029, Lusaka Rural, Central Province, Zambia, Personal Interview, April 19, 1995.

NORTHERN RHODESIA GEOLOGICAL SURVEY

The Geology and Groundwater Resources of the Lusaka Area, Report No 16 of 1963, J G Simpson, A R Drysdall, and H H J Lambert

REPUBLIC OF ZAMBIA

The Water Act, 1949, Chapter 312 of the Laws of Zambia

ZAMBIA GEOLOGIC SURVEY MAP

Sheet No SD-35-15, Geologic Map of the Lusaka Area, 1983, Scale 1:250,000, J G Thieme

7. FIGURES

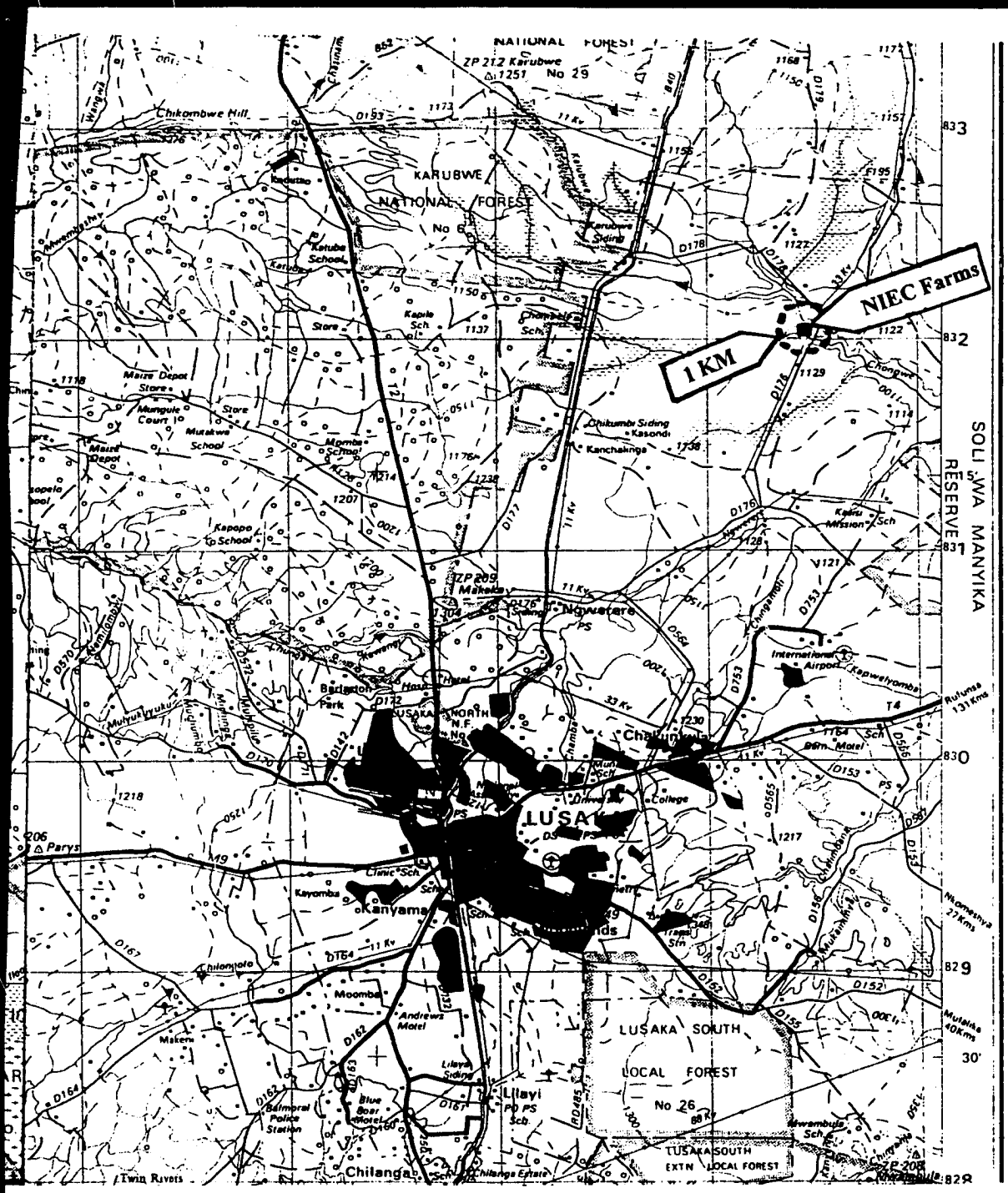
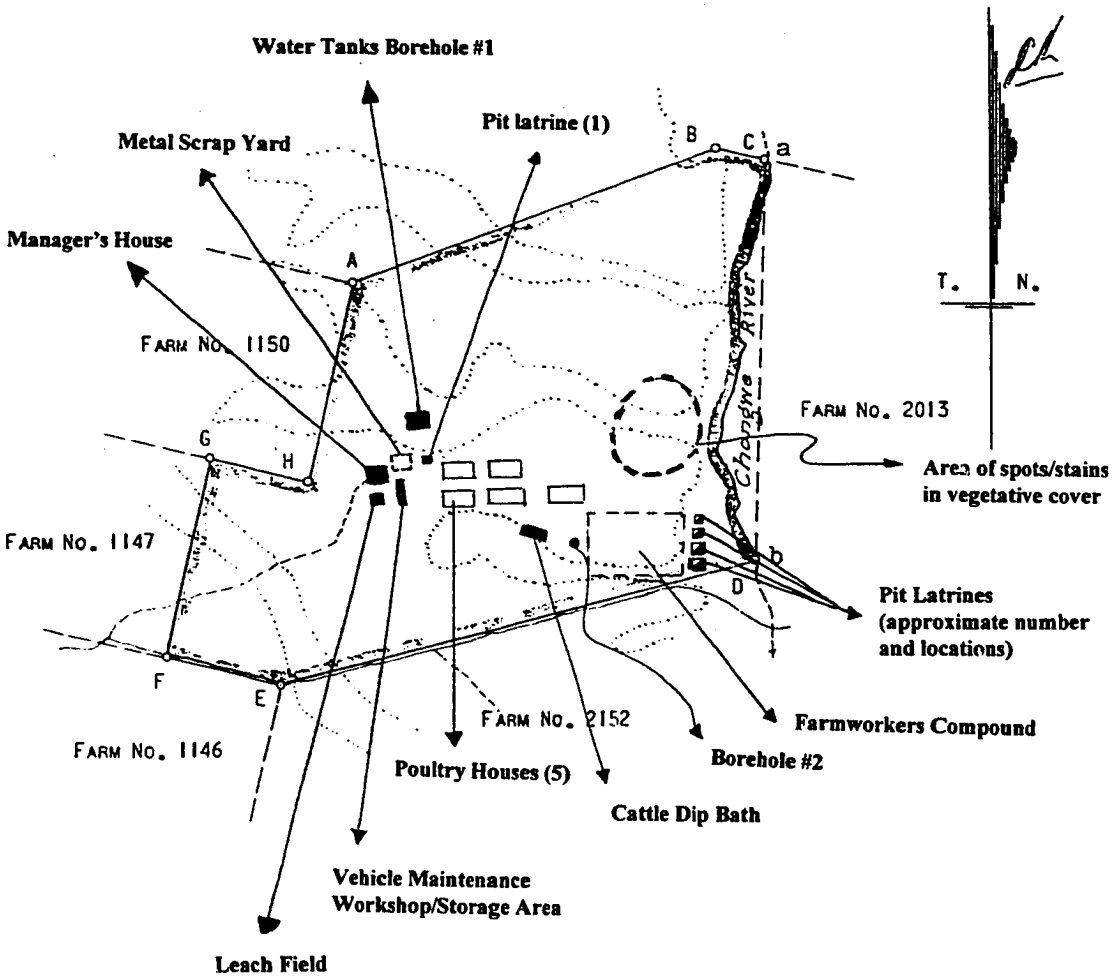


Figure 1
Facility Location Map
NIEC Farms Facility
Lusaka Rural
Central Province

—— 1 kilometer radius



4000 2000 0 4000 8000 ENGLISH FEET

SCALE: 1 : 50,000

THE FIGURE A - B - C - a - INNER EDGE OF CHONGWE RIVER - b - D - E - F - G - H - A

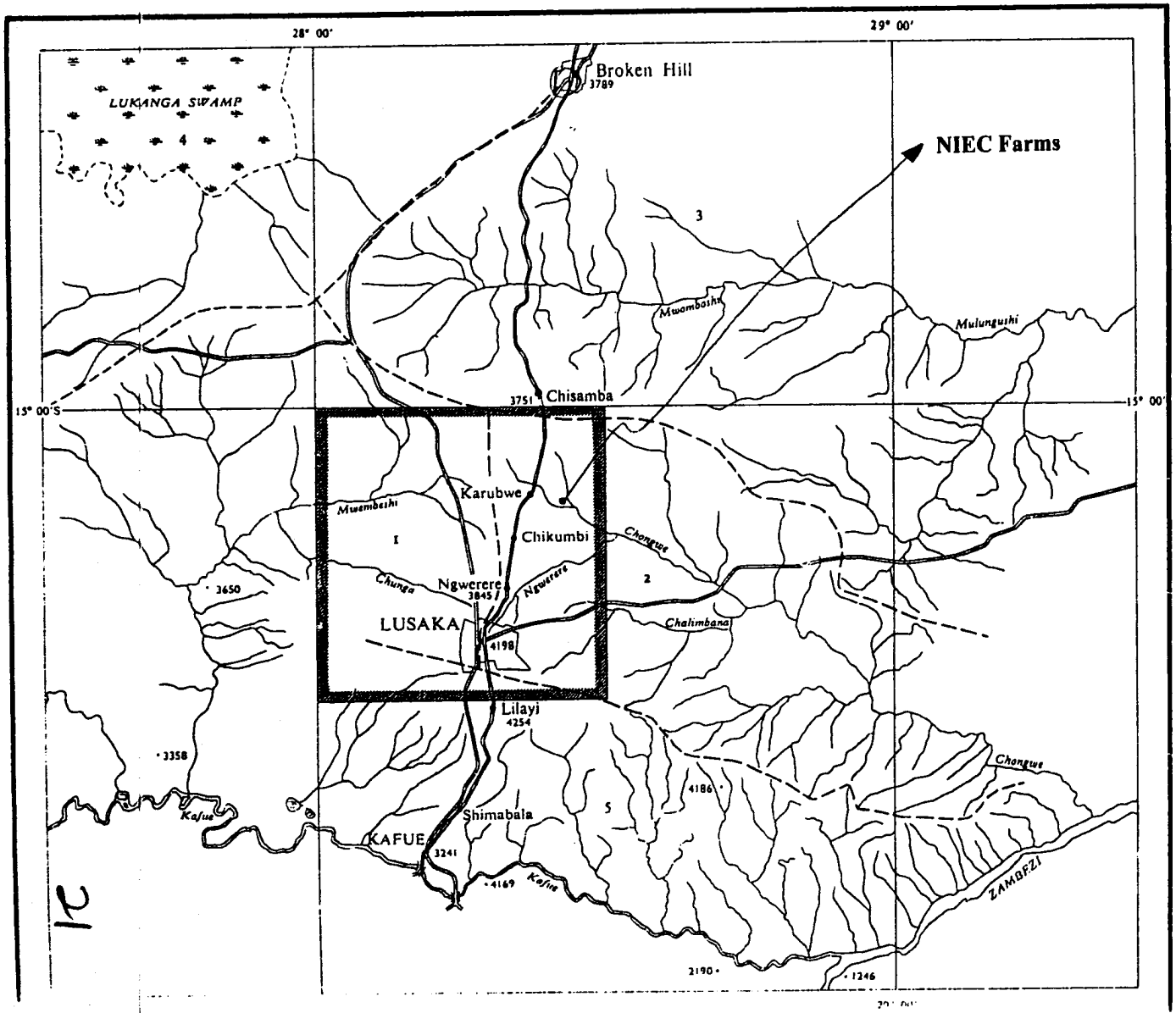
REPRESENTS 3042.597 ACRES OF LAND BEING FARM NO. 2029

SITUATE IN THE CENTRAL CADASTRAL DIVISION, NORTHERN RHODESIA (CENTRAL PROVINCE)

SURVEYED IN SEPTEMBER - DECEMBER, 1954 & MARCH - APRIL, 1957

Figure 2
Facility Site Plan
NIEC Farms Facility
Lusaka Rural
Central Province

Drainage Basins surrounding the NIEC Farms Basin



EXPLANATION

0 1 2 3
Scale in miles

1 Chunga-Mwambeshi Basin
2 Chongwe Basin
3 Mwomboshi-Lunsemfwa Basin
4 Lukanga Basin
5 Kafue Basin

Approximate boundary of drainage basin

4186 Spot height in feet

Area mapped

(REF NRGS, 1963)

Figure 3
NIEC Farms - Drainage Basins

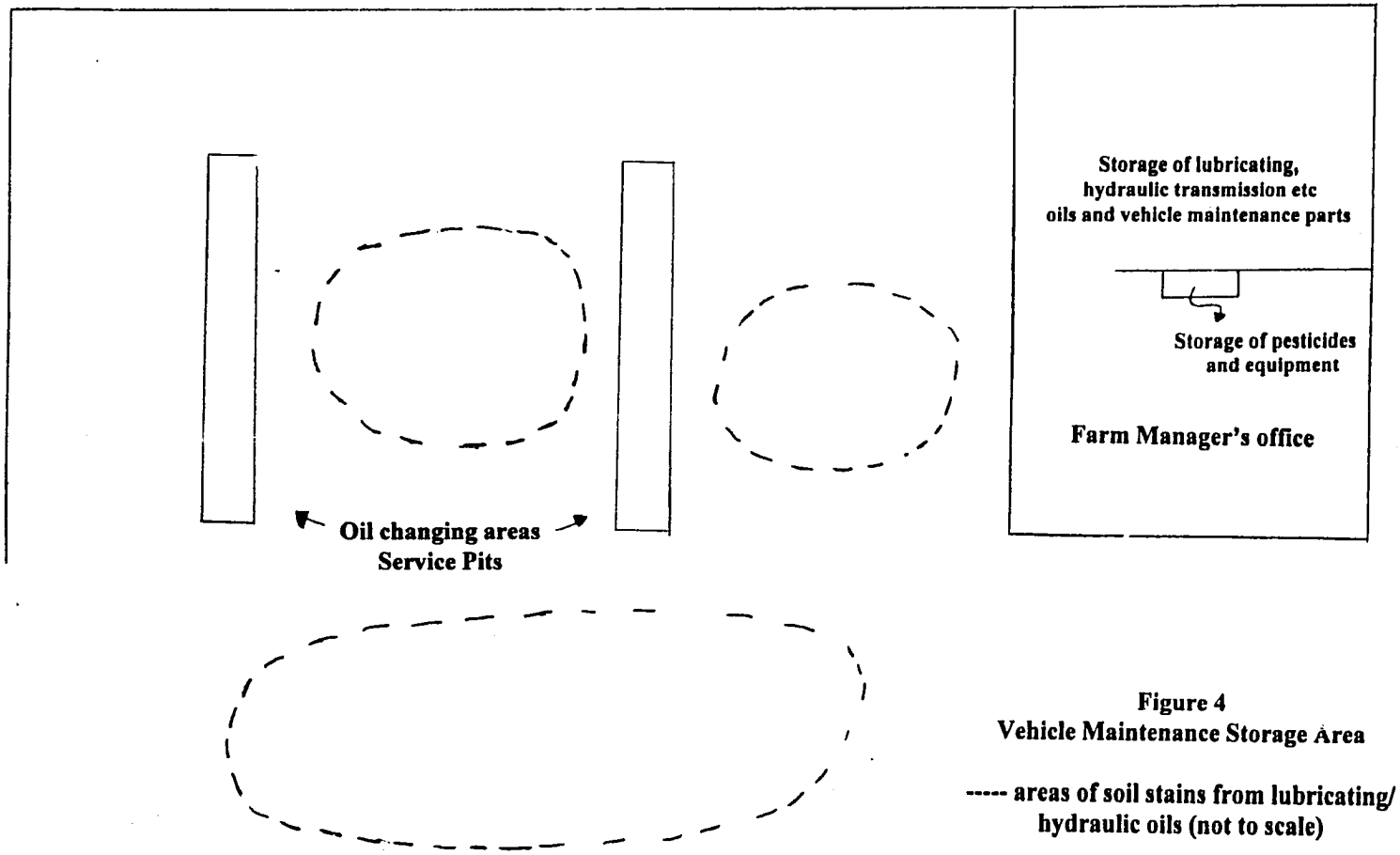
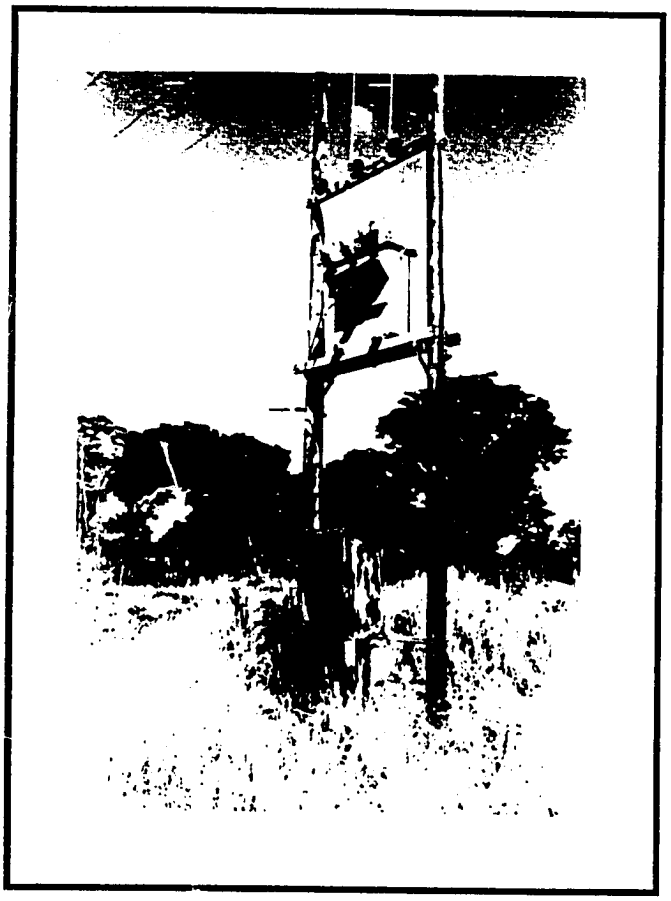


Figure 4
Vehicle Maintenance Storage Area

----- areas of soil stains from lubricating/ hydraulic oils (not to scale)

8. PHOTOGRAPHS



Photograph 1

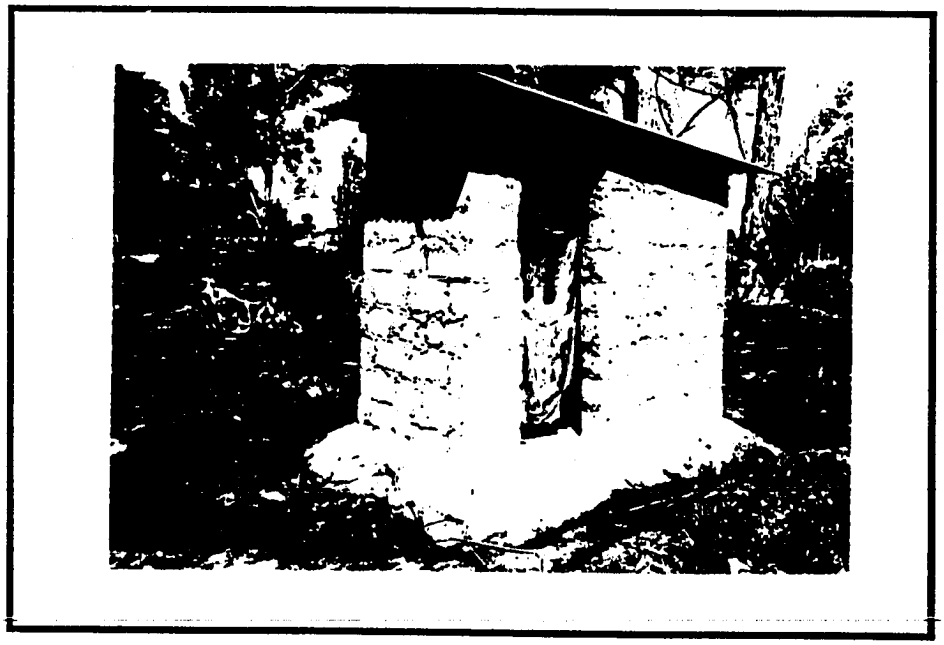
TRANSFORMER ON NIEC FARMS PROPERTY

Photograph 2

WATER TANKS AND BOREHOLE NO 1 AREA

Photograph 3

CATTLE "DIP BATH"

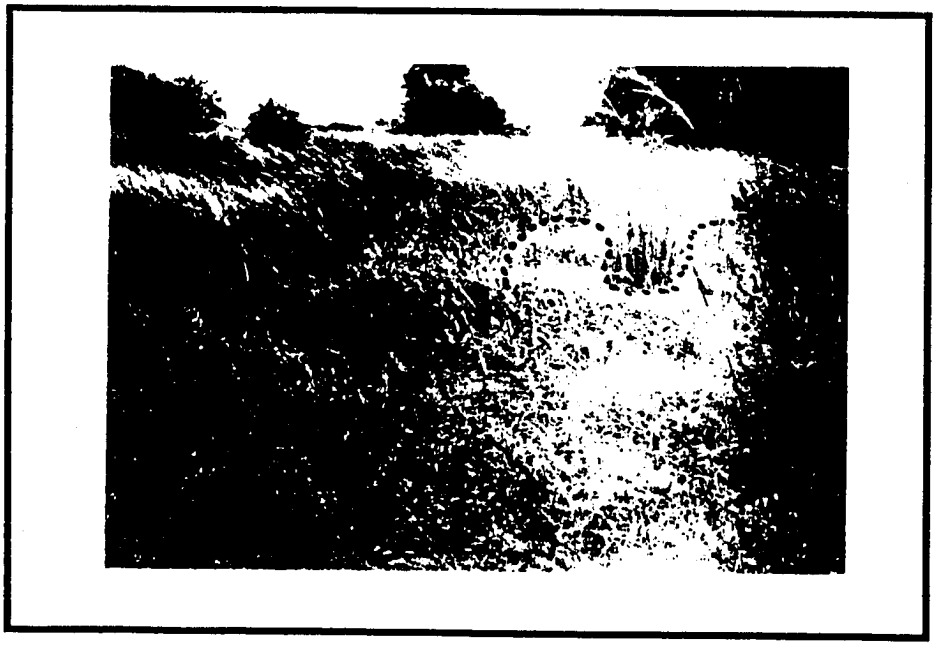


Photograph 4

PIT LATRINES AT FARM WORKERS COMPOUND

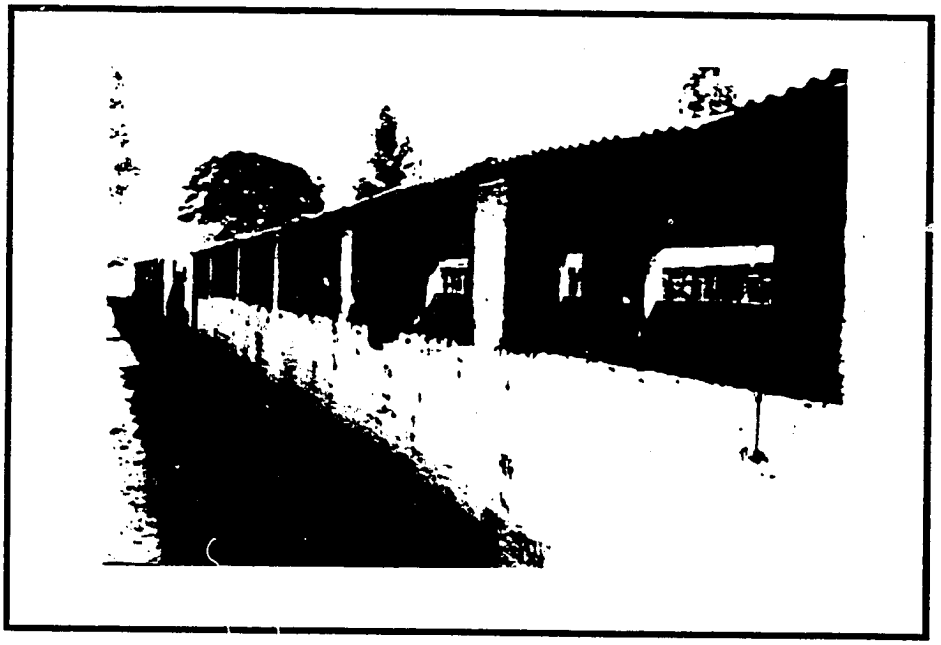
Photograph 5

STORAGE OF OILS, LUBRICANT, ETC AT WORKSHOP / VEHICLE MAINTENANCE AREA



Photograph 6

STAINS/SPOTS IN/SOIL AND VEGETATIVE COVER



Photograph 7

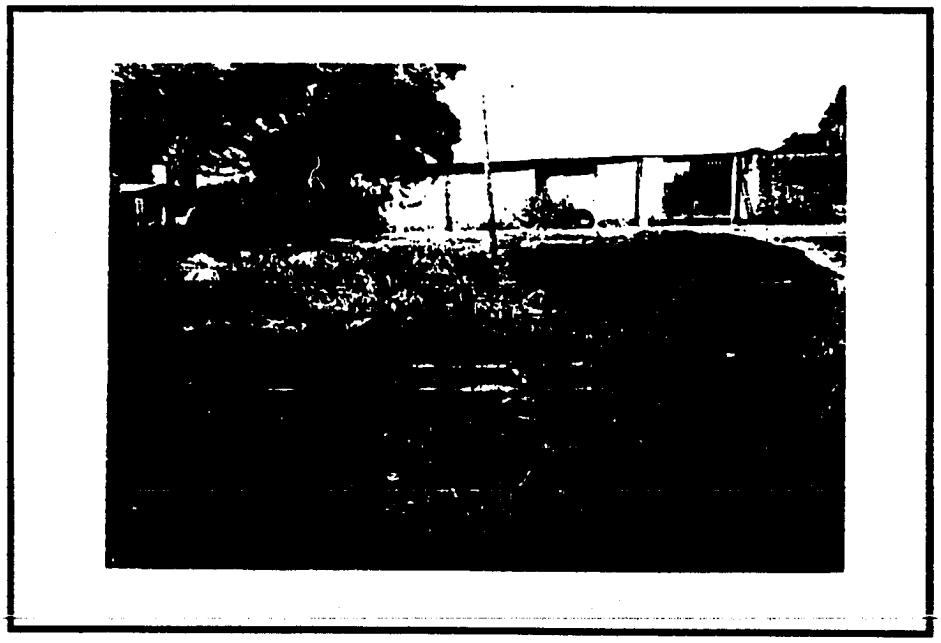
POULTRY HOUSES AT NIEC FARMS

Photograph 8

SCRAP METAL YARD

Photograph 9

STORAGE OF PESTICIDES (FUNGICIDES) AND INSECTICIDES SPRAYING EQUIPMENT



Photograph 10

EVIDENCE OF RECENT FIRE AT NIEC FARMS

9. APPENDICES

Appendix A
ZPA QUESTIONNAIRE

NO ZPA QUESTIONNAIRE
WAS RETURNED FOR THIS FACILITY

Appendix B
PH ASSOCIATES QUESTIONNAIRE

NO PH ASSOCIATES QUESTIONNAIRE WAS RETURNED FOR THIS FACILITY

Appendix C
MINISTRY RECORDS, REVIEW AND INTERVIEWS

MINISTRY REVIEWS AND INTERVIEWS

PH Associates interviewed Ministry personnel and other pertinent organizations to discuss the current state of environmental affairs and regulations in Zambia. Ministry records pertaining to assessed sites were requested, however, minimal data was acquired because many of the environmental Ministries are either relatively new and have limited records or there is a lack of funding for the environmental programs and inspections. A more detailed discussion of the environmental regulations for Zambia are presented in Appendix D and a summary of interviews are discussed below.

ENVIRONMENTAL COUNCIL OF ZAMBIA

Mr Julius Kanyembo - Director
Mrs I Mbewe - Legal Officer

On April 13, 1995, Ms Elena Pomar/PH Associates visited Mr Julius Kanyembo, Director of the Environmental Council of Zambia (ECZ). Information on the enforcement of the regulations was obtained on April 24, 1995 from Mrs Mbewe, Legal Officer for the Environmental Council of Zambia. The ECZ was started in 1990 to develop and implement regulations under the Environmental Protection and Pollution Control Act, but it was not functionally operating until June 1992. Legislation and regulations on water pollution control, waste management, environmental impact assessments were recently enacted in 1993 and 1994 and are currently in the process of enforcement. Inspection and site assessments have been conducted in very limited, selected cases. No enforcement activities have been conducted for the Pesticides and Toxic Substances Regulations. Regulatory policy and resolutions are currently being drafted on air pollution and wetlands management. The Environmental Council has set the following regulations in place under the Environmental Protection and Pollution Control Act of 1990:

The Water Pollution Regulations, 1993
These regulations determine the type and amount of effluent that can be discharged from a site and permit requirements.

The Waste Management Regulations, 1993
Requires licensing for transporters of solid and hazardous waste and for operators of waste disposal facilities.

Environmental Impact Assessment Regulations, 1994
These regulations require an environmental evaluation and licensing for new project developments, repairs, and expansion to existing projects.

The Pesticides and Toxic Substances Regulations, 1994
Requires registration with ECZ if manufacturing or importing/exporting a new pesticide or toxic substance.

The ECZ has very limited documentation on contaminated sites or industrial discharges since the Council was only established in 1990.

MINISTRY OF ENERGY AND WATER DEVELOPMENT

Mr Stan Chisala - Senior Engineer Water Affairs

On April 18, 1995, Ms Pomar visited Mr Stan Chisala, Senior Engineer of the Water Affairs Department (WA), in the Ministry of Energy and Water Development. The WA was established by the Water Act of 1949, which provides for the control, ownership, and use of water. Mr Chisala stated that the Ministry does not keep any environmental pollution records for any industry in Zambia.

PH Associates was provided with a copy of the November 1994 National Water Policy issued by the Ministry of Energy and Water Development. This document serves as a guide to conservation management, demand, and supply of water resources in the country. The National Water Policy, however, has no specific policy regarding contamination or water quality control by major industries, including the Council water supply.

The Water Supplies and Water Resources Management Division of WA is expected to have a program in place within a year to monitor the quantity and quality of groundwater boreholes. Enforcement of this program will be made by the Environmental Council of Zambia. Water Affairs also hopes to have the funding to do more adequate monitoring of boreholes for bacteriological analysis in the future. They currently have a chemist to conduct sampling and analysis but these activities have not been performed due to lack of funding.

Mr Chisala discussed some of WA's concerns about industrial and domestic wastewater discharges into some of the major surface water bodies of Zambia. Industries such as textile mills, tanneries, fertilizer producers, breweries and domestic sewage are of great concern in the potential contamination of rivers. Solid waste was also pointed out to be a potential contamination problem in Zambia since most of the municipal councils do not have designated areas for the disposal of these wastes. Wastewater drainage was discussed as being inadequate since the problem of stagnation is present throughout the industrial and urban areas of the country.

MINISTRY OF LABOR AND SOCIAL SECURITY

Mr K Mapani - Chief Inspector of Factories
Mr Kakoma Chivundu - Inspector of Factories
Mr Lukwesa - Inspector of Factories

Mr K Mapani, Chief Inspector of Factories for the Ministry of Labor and Social Security, was interviewed on April 20, 1995, by Ms Pomar to request available information on the sites where environmental assessments are to be conducted by PH Associates. There is approximately 10 years of available data for facility site inspections at the Ministry of Labor and Social Security. Mr Mapani stated that his office is basically concerned with inspections of factory sites where accidents or complaints have been filed.

The Chief Inspector of Factories currently has approximately 364 factory/industrial sites entered into a database, and a series of old reports. A database template was prepared for each site and includes a workplace number, industry classification and various parameters on Worker Health and Safety. The database was found to be poorly maintained and apparently the best information is found in the original site inspection reports. According to Mr Mapani, the department is currently understaffed by about 50%, thus regular visits to all facilities are difficult to perform.

On April 28, 1995, Ms Pomar met with Mr Kakoma Chivundu and Mr Lukwesa, both Factory Inspectors. PH Associates were provided with site inspection reports for several sites where environmental assessments will be performed. These are summarized in the individual reports, where applicable. Typical problems that are encountered during their site inspections include old and outdated machinery that can cause accidents, lack of maintained fire extinguishers, and noise and air quality problems.

MINISTRY OF MINES AND MINERALS DEVELOPMENT

Mr O Mg'ambi - Acting Director of Geological Survey Department
Mr Clement Namateba - Senior Geologist (PGR), Geological Survey

PH Associates met with Mr O Mg'ambi, Acting Director and Mr Clement Namateba, Senior Geologist of the Geological Survey Department to discuss the regional geologic and hydrogeologic setting of Zambia. A listing of available geologic and hydrogeologic reports and maps were provided by the Department, and those covering the sites to be assessed were purchased.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

Mr Gedion Nkojo - Resident Representative, World Bank
Mr Julius Chileshe - National Resource Economist, World Bank

On April 24, 1995, Ms Pomar met with Mr Gedion Nkojo, Resident Representative and Mr Julius Chileshe, Natural Resource Economist of the World Bank to request any information regarding historical data for the sites where environmental assessments are to be conducted. Mr Nkojo and Mr Chileshe stated that there was no specific environmental information for the sites.

The importance of having a unified and more focused plan for addressing environmental concerns in the country on behalf of the Government of Zambia (GOZ), NGOs (Non-Government Organizations), International Development Organizations (such as World Bank, UNDP, African Development Bank, etc), and other donor countries, was discussed at great length. The World Bank is presently working on an Environmental Support Program to be included in the National Environmental Action Place for the Secretariat of the Ministry of Environment and Natural Resources.

Appendix D
ENVIRONMENTAL REGULATIONS OF ZAMBIA

ENVIRONMENTAL REGULATIONS OF ZAMBIA

As part of the PH Associates scope of work, legislative Policies, Acts, and Regulations enacted by Zambia were reviewed for their applicability to completing environmental assessments of the enterprises identified by the ZPA for privatisation. The purpose of the review was to evaluate and summarize those guidelines pertaining to environmental issues which industries in Zambia are required to adhere. The industries to be assessed include food, agricultural and livestock farmlands, pharmaceutical drug, textile, sawmilling, storage and transportation, construction and engineering, mining and petroleum.

Regulations addressing the protection of human health and the environment have only recently been enacted in any detail. Prior to the passing of the Environmental Protection and Pollution Control Act of 1990 and the establishment of the Environmental Council of Zambia, legislation mostly addressed issues of worker health and safety.

Twelve regulations were selected for review based on their potential applicability to the assessed sites, and are listed in Table 1. Six of these regulations address environmental issues concerning air, soil, and water pollution and include:

- Water Act of 1949
- Environmental Protection and Pollution Control Act of 1990
- Water Pollution Control Regulation of 1993
- Waste Management Regulations of 1993
- Mining (Dumps) Regulations of 1972
- Mines and Minerals Act of 1976

These regulations are summarized in Table 2 and used to evaluate the environmental compliance of the facilities assessed by PH Associates. Of the six regulations listed above, the first four comprise the majority of established environmental legislation and are applicable to most of the assessed industries.

TABLE 1 ENVIRONMENTAL REGULATIONS AND ENFORCING MINISTRIES OF ZAMBIA		
Policy, Act, or Regulation	**Year Adopted**	**Responsible Ministry**
Water Act	1949	Ministry of Energy and Water Development (Water Board)
National Water Policy	1994	Ministry of Energy and Water Development
Environmental Protection and Pollution Control Act	1990	Environmental Council of Zambia
Water Pollution Control (Effluent and Wastewater) Regulations	1993	Environmental Council of Zambia
Waste Management (licensing of Transporters of Wastes and Waste Disposal Sites) Regulations	1993	Environmental Council of Zambia
Pesticides and Toxic Substances Regulations	1994	Environmental Council of Zambia
Environmental Impact Assessment Regulations	1994	Environmental Council of Zambia
Petroleum Act	1930	Ministry of Energy and Water Development (Department of Energy)
Petroleum (Exploration and Production) Act	1985	Ministry of Energy and Water Development (Department of Energy)
Agricultural (Fertilizers and Feed) Act	1990	Ministry of Agriculture
Mining (Dumps) Regulations	1972	Ministry of Mines and Minerals Development
Mines and Minerals Act	1976	Ministry of Mines and Minerals Development

TABLE 2 APPLICABLE ENVIRONMENTAL REGULATIONS OF ZAMBIA	
ACT OR REGULATION	**APPLICABLE REGULATIONS**
The Water Act 1949	• Any person(s) shall have the right to the primary use of public water which is found in its natural channel where access is lawful. • A person(s) must have permission from the Water Board (WB) to impound, store, or divert water from a public stream for primary (drinking), secondary (irrigation), or tertiary (mechanical or industrial) use. • Any land owner must have permission from WB for use of private water supply. • Local authorities must get permission from WB to use public water for primary or tertiary use. • Any person(s) who willfully or through negligence pollutes or fouls any public water so as to render it harmful to man, beast, fish, or vegetation, shall be guilty of an offense.
The Environmental Protection and Pollution Control Act 1990	<u>Water Regulations</u> • No person may discharge (directly or indirectly), poisonous, toxic, obnoxious or obstructing matter, radiation or other pollutants into surface or groundwater bodies. • Industrial/trade owners or operations that discharge effluent from the facility into existing sewage system must obtain written permission from the local authority. • Local authority sewage systems may impose special conditions (ie pretreatment) to facilities that discharge effluent into their system. • Effluent may be mixed for treatment prior to discharge or for conveyance to common point of discharge. • No local authority sewage system or industry/trade shall discharge (directly or indirectly) effluent into surface water or groundwater environment without a license. Any changes to the type, quantity of pollutant, or discharge location must be authorized by the Inspectorate. <u>Waste Regulations</u> • No person(s) shall discharge waste so as to cause pollution in the environment. Based on the interpretation of this regulation by the ECZ, it is illegal to dump or bury waste anywhere but at a licensed disposal facility (no backyard dumping). • No person(s) shall transport waste to any site other than a licensed disposal facility. • Any person(s) intending to operate a waste disposal plant or generate hazardous waste must have a license. • No person(s) shall import any hazardous waste into Zambia. • No hazardous waste shall be exported to any country without a Council (ECZ) permit and consent of receiving country. • No hazardous waste shall be transported within or through Zambia without a Council permit.

ACT OR REGULATION	APPLICABLE REGULATIONS
Water Pollution Control Regulations of 1993	<u>License to Discharge Wastewater</u> • All commercial, municipal, and industrial facilities must possess a license to discharge wastewater that may pollute the environment. • Keep facility records of the licensed activities. • Conduct weekly sampling and testing of discharged wastewater at locations designated by ECZ Inspectorate. • The quality of wastewater discharged must meet the conditions and standards for all parameters contained in Table 3. If any wastewater test results exceed these standards, they must be reported to the Inspectorate within 12 hours. • Monitor the volume of wastewater discharged from the site using a metering device. • Submit bi-annual reports to the ECZ Inspectorate including the mean monthly test analyses results and mean monthly volume of wastewater being discharged. <u>License to Withdraw Water</u> • Facilities must posses a license to withdraw water from a watercourse for the purpose of diluting effluent. • The source of water being withdrawn would not significantly affect the water course. • The license holder must treat effluent so there are no adverse effects to the surface and groundwater environment. • The license holder must keep a record of licensed activities and provide a report to ECZ Inspectorate every six months. • The license holder must conform to all the following wastewater discharge regulations.
Waste Management Regulations 1993	• All commercial, municipal, or industrial facilities must posses a license to transport solid wastes offsite. • During loading and transport, wastes cannot be scattered, flowing out, or emitting bad smells. • Vehicles must transport wastes along approved, scheduled routes. • Transporter license may be valid from 6 months to 3 years depending on the transporters compliance with these regulations.
The Mining Regulations 1972	• Supervise/inspect site for the prevention of pollution of the surroundings or abatement of any nuisance.
The Mines and Minerals Act 1976	• Avoidance of wasteful mining practices or wasteful metallurgic practices. • Any effluent water discharged from any treatment or other process at a mine must comply with the provisions of the Water Act.

THE WATER ACT
Chapter 312, Adopted 1949, Amendments up to 1970

The Water Act provided the initial guidance for the control, ownership, and use of water in Zambia. This Act established the Water Board (WB) in the Ministry of Energy and Water Development.

The purpose of the Water Board is to supervise all public streams in Zambia, protect the source of water streams, maintain and improve streams, and help prevent unlawful acts (polluting) of streams. The Act does not apply to the Zambezi, Luapula, and part of the Luangwa River.

Applicable Regulations

The Act provides for some basic laws on water rights, some of the regulations that may apply to the assessed sites include:

- Any person(s) shall have the right to the primary use of public water which is found in its natural channel where access is lawful.
- A person(s) must have permission from the WB to impound, store, or divert water from a public stream for primary (drinking), secondary (irrigation), or tertiary (mechanical or industrial) use.
- Any land owner must have permission from WB for use of private water supply.
- Local authorities must get permission from WB to use public water for primary or tertiary use.
- Any person(s) who willfully or through negligence pollutes or fouls any public water so as to render it harmful to man, beast, fish, or vegetation, shall be guilty of an offense.

NATIONAL WATER POLICY OF 1994

This policy discusses planning, implementation strategies, management, and development of water resources for Zambia, and was issued as an internal guidance document under the National Water Policy Development Initiative (Water Development Board) by the Ministry of Energy and Water Development. The Water Development Board proposes and amends existing legislation and enacts new legislation.

Applicable Regulations

None. The policy does not provide any water regulations.

THE ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL ACT
Act No 12, Adopted 1990

This Act provides for the protection of the environment, the control of pollution, and the establishment of the Environmental Council of Zambia (ECZ). The ECZ consists of representatives from 25 different ministries, and formulates policies relating to environmental management of natural resources and the control of industrial and other sources of pollution. The Council reviews environmental government reports, conducts studies and promotes research, educates the public about environmental issues, and conducts other relevant tasks.

The Act includes regulations for water, air, waste, pesticides and toxic substances, noise, ionizing radiation, and natural resource conservation. Many of these regulations are the basis for the updated Water Pollution Control Regulations (1993), Waste Management Regulations (1993), Pesticides and Toxic Substances Regulations (1994), and Environmental Impact Assessment Regulations (1994).

This Act and the ECZ were initiated in 1990, although the Council was not fully operational until June 1992 (Appendix C). Since the ECZ is still a relatively new institution, air, hazardous and toxic waste, and noise standards have not been established.

Applicable Regulations

The Act provides generalized regulations that are applicable to discharge of solid waste and wastewater pollutants into the environment.

Water Regulations

- No person may discharge (directly or indirectly), poisonous, toxic, obnoxious or obstructing matter, radiation or other pollutants into surface or groundwater bodies.
- Industrial/trade owners or operations that discharge effluent from the facility into existing sewage systems must obtain written permission from the local authority.
- Local authority sewage systems may impose special conditions (ie pretreatment) to facilities that discharge effluent into their system.
- Effluent may be mixed for treatment prior to discharge or for conveyance to common point of discharge.
- No local authority sewage system or industry/trade shall discharge (directly or indirectly) effluent into surface water or groundwater environment without a license. Any changes to the type, quantity of pollutant, or discharge location must be authorized by the Inspectorate.

Air Regulations

Based on discussions with the ECZ (Appendix C), legislation and standards on air pollution are currently being drafted. A review of the air pollution section of this Act shows the following areas will be addressed:

- No person(s) will be allowed to emit any pollutants above emission standards (to be developed).
- Polluting facilities will be required to have licenses, conduct period air sampling and testing, and provide reports to the Inspectorate.

Until these regulations are completed and adopted, there are no applicable air emission requirements for Zambia.

Waste Regulations

Waste handling regulations are found in more detail in the Waste Management Regulations (1993).

- No person(s) shall discharge waste so as to cause pollution in the environment. Based on the interpretation of this regulation by the ECZ, (personal communication with Michael Sankwe/ECZ), it is illegal to dump or bury waste anywhere but at a licensed disposal facility (no backyard dumping).
- No person(s) shall transport waste to any site other than a licensed disposal facility.
- Any person(s) intending to operate a waste disposal plant or generate hazardous waste must have a license.
- No person(s) shall import any hazardous waste into Zambia.
- No hazardous waste shall be exported to any country without a Council (ECZ) permit and consent of receiving country.
- No hazardous waste shall be transported within or through Zambia without a Council permit.

Pesticides and Toxic Substances Regulations

Many of the regulations regarding pesticides and toxic substances relate to the manufacture, import or process of a "new" pesticide or toxic substance. Currently, there are no guidelines or standards defining specific materials or chemicals as toxic or hazardous.

Noise Regulations

No noise regulations are specified in the Act because the ECZ has yet to establish noise emission standards and guidelines.

THE WATER POLLUTION CONTROL (EFFLUENT AND WASTEWATER) REGULATIONS OF 1993

These regulations are part of the Environmental Protection and Pollution Control Act of 1990. The regulations require that any local authority intending to operate a sewage treatment system or owner/operator of any industry that discharges wastewater (directly or indirectly) into any surface water or groundwater environment must apply for a license through the Environmental Council of Zambia (ECZ). Person(s) must also have a license from ECZ to withdraw water from a watercourse for the purpose of diluting effluent.

ECZ has developed standards (limits) for 59 physical, bacteriological, chemical, organic, metal, and radioactive parameters. These parameters and standards are listed in Table 3. Discharged wastewater may NOT exceed these parameter standards.

Applicable Regulations

These wastewater discharge regulations are applicable to many of the sites to be assessed. The following conditions of the licenses are most noteworthy, refer to the original regulation for more specific details.

License to Discharge Wastewater

- All commercial, municipal, and industrial facilities must possess a license to discharge wastewater that may pollute the environment.
- Keep facility records of the licensed activities.
- Conduct weekly sampling and testing of discharged wastewater at locations designated by ECZ Inspectorate.
- The quality of wastewater discharged must meet the conditions and standards for all parameters contained in Table 3. Any wastewater test results which exceed these standards, must be reported to the Inspectorate within 12 hours.
- Monitor the volume of wastewater discharged from the site using a metering device.
- Submit bi-annual reports to the ECZ Inspectorate including the mean monthly test analyses results and mean monthly volume of wastewater being discharged.

License to Withdraw Water

- Facilities must posses a license to withdraw water from a watercourse for the purpose of diluting effluent.
- The source of water being withdrawn would not significantly affect the water course.

- The license holder must treat effluent so there are no adverse effects to the surface and groundwater environment.
- The license holder must keep a record of licensed activities and provide a report to ECZ Inspectorate every six months.
- The license holder must conform to all the wastewater discharge regulations.

TABLE 3
WATER POLLUTION CONTROL REGULATIONS
STANDARDS (LIMITS) FOR EFFLUENTS AND WASTEWATER

Parameter	Standards (Unit)
Temperature	40° C
Color	20 (Hazen units)
Odor and Taste	Threshold odor number
Turbidity	15 NTU
Total Suspended Solids	100 mg/L
Settleable Matter	0.5 mg/L
Total Dissolved Solids	3000 mg/L
Conductivity	4300 US/cm
Total Coliform	25000/100 ml
Fecal Coliform	5000/100 ml
Algae	1000 cells/100 ml
pH	6.0 - 9.0
Dissolved Oxygen	5 mg/L
Chemical Oxygen Demand	90 mg (average)
Biochemical Oxygen Demand (BOD)	50 mg/L (Mean Value)
Nitrates	20 mg/L lakes
	50 mg/L (watercourse)
Nitrite (NO2 as nitrogen)	2.0 mg/L
Organic Nitrogen	5.0 mg/L (Mean)
Total Ammonia and Ammonium (NH3)	10 mg/L
Cyanides	0.2 mg/L
Total Phosphorous (PO4)	1.0 mg/L
Sulfates	1500 mg/L
Sulfite	1.0 mg/L
Sulfide	0.1 mg/L
Chlorides	8000 mg/L
Active Chloride	0.5 mg/L
Active Bromine (Br2)	0.1 mg/L
Fluorides	2.0 mg/L
Aluminium	2.5 mg/L
Antimony	0.5 mg/L
Arsenic	0.05 mg/L
Barium	0.5 mg/L
Beryllium salts	0.5 mg/L
Boron	0.5 mg/L
Cadmium	0.5 mg/L
Total Chromium	0.1 mg/L
Cobalt	1.0 mg/L
Copper	1.5 mg/L
~~Iron~~	~~2.0 mg/L~~

Parameter	Standards (Unit)
Lead	0.5 mg/L
Magnesium	500 mg/L
Manganese	1.0 mg/L
Mercury	0.002 mg/L
Molybdenum	5.0 mg/L
Nickel	0.5 mg/L
Selenium	0.02 mg/L
Silver	0.1 mg/L
Thallium	0.5 mg/L
Tin	2.0 mg/L
Vanadium	1.0 mg/L
Zinc	10.0 mg/L
Total hydrocarbons	10.0 mg/L
Oils (Mineral and Crude)	5.0 mg/L
Phenols	0.2 mg/L (steam dist) 0.05 mg/L (non-steam dist)
Fats and saponifiable oils	20.0 mg/L
Detergents	2.0 mg/L
Total Pesticides and PCB's	0.5 mg/L
Trihaloforms	0.5 mg/L
Radioactive materials	Not permitted

NOTE
See original Water Pollution Control Regulations and third schedule for standard and test method details.

WASTE MANAGEMENT (LICENSING OF TRANSPORTERS OF WASTES AND WASTE DISPOSAL SITES) REGULATIONS OF 1993

These regulations are part of the Enviornmental Protection and Pollution Control Act of 1990. The regulations only address the handling of "solid waste" generated by commercial, municipal, and industrial sites (personal communication, Michael Sankwe/ECZ). The regulations do not apply to hazardous or toxic substances, generated at commercial, municipal, industrial or household sites. They also do not apply to residential domestic solid wastes of less than 45 kg (99 pounds) per week, or to the transport of inert (construction) debris.

Person(s) who transport solid wastes or own / operate solid waste disposal facility must have a license from the Environmental Council of Zambia (ECZ) and comply with all Waste Management Regulations.

Applicable Regulations

PH Associates will not be assessing any solid waste disposal sites, but will identify each of the assessed facilities method of solid waste disposal. The following regulations are applicable to the transporters of solid waste.

License to Transport Solid Waste

- All commercial, municipal, or industrial facilities must posses a license to transport solid wastes offsite.
- During loading and transport, wastes cannot be scattered, flowing out, or emitting bad smells.
- Vehicles must transport wastes along approved, scheduled routes.
- Transporter license may be valid from 6 months to 3 years depending on the transporters compliance with these regulations.

THE PESTICIDES AND TOXIC SUBSTANCES REGULATIONS OF 1994

This regulation is part of the Environmental Protection and Pollution Control Act of 1990 and applies to person(s) intending to manufacture, import, export, improve, or process a "new" pesticide or toxic substance. The regulation includes specifications on product handling, use, storage, disposal, labeling, packaging, and worker health and safety issues.

Applicable Regulations

None. PH Associates will be assessing a pharmaceutical drug company that does not manufacture, import, export, improve, or process new pesticides or toxic substances.

ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS OF 1994

These regulations are part of the Environmental Protection and Pollution Control Act of 1990. The regulations require that a project brief and environmental impact study be performed for any new project, extension, repair, or maintenance of an existing project. This is to determine whether a project may have adverse or other significant impacts on the environment. Some of the projects that may require an environmental impact study include transportation, dams, mines, forestry, agriculture, industrial facilities such as refineries, tanneries, mineral and lime processing, foundries, breweries, motor assemblers, food processing, electrical substitutions, gas or fuel storage, and solid or hazardous waste disposal site.

Applicable Regulations

None. The environmental impact assessment regulations apply to new projects or existing projects where extension, repair, or maintenance occur. All facilities that PH Associates will assess are existing projects where there are no changes occurring, or operations which are closing down.

THE PETROLEUM ACT
Chapter 424, Adopted 1930, numerous amendments up to 1969

The Act regulates the importation, conveyance, and storage of petroleum and other inflammable oils and liquids. This includes all petroleum, coal, schist, shale or other bituminous by-products. The Act requires licensing to transport or posses dangerous petroleum (gasoline, diesel etc.) and other dangerous petroleum. Dangerous petroleum transported on a public road must be in suitable and secure vessels that are certified and licensed by the Road Traffic Commissioner.

Licenses are required for possession of dangerous petroleum (exceeding 44 gallons) stored in non-inflammable storage sheds. A 55 foot buffer zone should surround the shed, and no storage sheds must be spaced less than 3 feet apart. Petroleum tanks located outside of sheds must be fenced with a 50 foot buffer zone.

Applicable Regulations

None. The Petroleum Act deals mainly with safety requirements and does not address underground storage tank or environmental issues such as storage tank integrity, leaks, or proper abandonment of tanks. Therefore, the Act does not apply to air, soil, or water pollution issues.

THE PETROLEUM (EXPLORATION AND PRODUCTION) ACT
No 13, Adopted 1985

This Act regulates petroleum exploration, development, and production in Zambia. It establishes a Petroleum Committee that regulates titles, contracts, and the control of petroleum operations prior to the export or entry into a refinery.

Applicable Regulations

The Act does not apply to petroleum depots, refineries or gas stations, which are the type of sites to be assessed by PH Associates.

THE AGRICULTURAL (FERTILIZERS AND FEED) ACT
Chapter 351, Adopted 1990

This Act regulates and controls the manufacture, processing, importation, and sale of agricultural fertilizers and farm feed. It also provides effectiveness and purity standards for fertilizers and feed.

Applicable Regulations

None. The Act does not address the usage or disposal of fertilizers and feed at agricultural and livestock farms and therefore does not apply to any of the assessed sites.

THE MINING (DUMPS) REGULATIONS
Chapter 329, Section 132, Adopted 1972

These regulations provide guidelines for the maintenance of mine dumpings (consisting of solid or liquid materials) such as proper water drainage and diversion, and generally keeping the dump site stable. A designated Chief Mining Inspector regulates changes relating to the design and nature of the mine dumpings and requires periodic reporting from the management.

Applicable Regulations

The regulation does not address specific environmental issues on air, soil, and water pollution. There is one very general provision included in the regulation:

- Supervise/inspect site for the prevention of pollution of the surroundings or abatement of any nuisance.

THE MINES AND MINERALS ACT
Chapter 329, No 32 Adopted 1976
Amendments in 1981, 1984, and 1992

The Act determines the policy requirements for exploration, prospecting, and mining licenses and regulates the renewal and termination of mining rights. The amendments mainly deal with increased licensing, permit, and surveying fees. The Act requires proper sanitation and adequate water supply for workers, and many health and safety issues such as exposure and safe handling of inflammable, explosive, and radioactive materials.

Applicable Regulations

Environmental issues relating to air, soil, and water pollution, generated by surface and underground mining operations are generally not addressed by the Act, with the exception of the following:

- Avoidance of wasteful mining practices or wasteful metallurgic practices.
- Any effluent water discharged from any treatment or other process at a mine must comply with the provisions of the Water Act.

Reference can be made to the Water Act for specifics relating to discharged wastewater. The Mines and Minerals Act does have some mine siting criteria and abandonment requirements. However, these requirements do not apply to the existing (active) mine site to be assessed by PH Associates.

REFERENCES

ENVIRONMENTAL COUNCIL OF ZAMBIA
Conditions Governing the License to Discharge Effluent and Wastewater, The Water Pollution Control (Effluent and Wastewater) Regulations, 1993

GOVERNMENT OF ZAMBIA
Agriculture (Fertilizers and Feed) 1990, Chapter 351 of the Laws of Zambia

GOVERNMENT OF ZAMBIA
Environmental Impact Assessment Regulations 1994, Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA
The Environmental Protection and Pollution Control Act, No 12 of 1990

GOVERNMENT OF ZAMBIA
National Water Policy, 1994

GOVERNMENT OF ZAMBIA
The Mines and Minerals Act, 1976, Chapter 329 of the Laws of Zambia

GOVERNMENT OF ZAMBIA
The Mining (Dumps) Regulations, 1972, Chapter 329 of the Laws of Zambia, Section 132

GOVERNMENT OF ZAMBIA
The Pesticides and Toxic Substances Regulations, 1994, Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA
The Petroleum (Exploration and Production) Acrt, 1985

GOVERNMENT OF ZAMBIA
The Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 - Statutory Instrument No 71 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA
The Water Pollution Control (Effluent and Wastewater) Regulations, 1993 - Statutory Insturment No 72 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

REPUBLIC OF ZAMBIA
The Petroleum Act, 1930, Chapter 424 of the Laws of Zambia

REPUBLIC OF ZAMBIA
The Water Act, 1949, Chapter 312 of the Laws of Zambia

SANKWE M K
Environmental Council of Zambia, P O Box 35131, Lusaka, Zambia; telephone 224009; Personal Communication, May 19, 1995

Appendix E
ENVIRONMENTAL ASSESSMENT CHECKLIST

CONFIDENTIAL

ENVIRONMENTAL ASSESSMENT CHECKLIST

Facility NIEC FARMS

Location FARM 2029, RURAL LUSAKA, CENTRAL PROVINCE, LUSAKA

Date Assessed APRIL 17, 1995

Prepared for
Zambia Privatisation Agency

CONFIDENTIALITY STATEMENT

This is an internal document, prepared by PH Associates, Inc., for the use of USAID.

The information contained in this document is confidential and proprietary in nature, and is to be used in conjunction with other facts and data for the sole purpose of providing information concerning potential environmental liabilities.

1.0 GENERAL INFORMATION

1.1 Facility Name NIEC FARMS

1.2 Locations(s) FARM 2029

1.3 Dates of Assessment(s) APRIL 19, 1995

1.4 Assessors M. ELENA TOMIAR, PH ASSOCIATES, INC

2.0 FACILITY PROFILE

2.1 Address MAILING ADDRESS - P.O. BOX 31343, LUSAKA

2.2 Telephone (DISCONNECTED)

2.3 Telex / TWX / Fax

2.4 Facility Manager / Assessment Contact

MR. ARNOLD KAOLA, NIEC FARMS MANAGER

2.5 Individuals consulted as part of this assessment, including their affiliation and titles

NAME (S)	TITLE (S)
MR. A. KAOLA	NIEC FARM'S MANAGER
MR. JOHN CHIPAMBULE	" " ACCOUNTANT

2.6 Number of employees full time 9 EMPLOYEES TOTAL - FARM NOT OPERATIONAL

Number of employees part time NONE.

2.7 Operational schedule (number of shifts / hours per day / days per week) NOT IN OPERATION SINCE JANUARY 1995

2.8 Total site area 3,042.6 ACRES

2.9 Total number of buildings MANAGER'S RESIDENCE, VEHICLE MAINTENANCE/WORKSHOP (AND OIL STORE ROOM), WATER-TANKS (2) AND PUMPHOUSE NO. 1, 5 POULTRY HOUSES, 17 FARMWORKERS' HOUSES IN COMPOUND, CATTLE DIP BATH, SUNKAL PIT LATRINES (DID NOT KNOW EXACTLY)

2.10 Facility inputs (raw materials, chemicals, fuels, lubricants, pesticides, etc) HISTORICAL DATA TO NIEC FARMS

Input	Quantity / Year
FEED - READY MADE	620 TONS
PESTICIDES (FUNGICIDES)	< 10 KG
INSECTICIDES	20 LITERS
NAME & COMPOSITION NOT KNOWN	
DIP FOR CATTLE - "SUPONA" - CHLORFENVINFOS	500 LITERS
" "DELTAMETRINE" - PYRETHROID	10 LITERS

2.11 Describe facility production processes of environmental consequence

When operational, NIEC FARMS was a livestock farm of cattle and poultry. Approximately 2,000 heads of cattle and approx. 14,000 chickens. Livestock was sold over a 4 year period since Oct. 1990.

2.12 Facility products

Product	Quantity / Year
BEEF	
POULTRY	SEE 2.11
VEGETABLE GARDEN FOR THEIR OWN USE - NIEC FARMS STAFF	

2.13 What sources of energy are used at the facility? (Electric, oil, coal, wood, charcoal)

Electrical supply from ZESCO for the main building

3.0 FACILITY HISTORY / LAND USE / PERMITS

3.1 Age of facility and date operations began

NIEC FARMS started in October 1990 with 2,000 heads of cattle & 14,000 chickens

3.2 Land use prior to current enterprise Tobacco (cash crop for the area) and maize (

3.3 Is there a history of potentially hazardous solid waste or waste water? According to management, heavy use of fertilizers and chemicals applied for the growth of tobacco and maize. Resulted in lack of vegetative growth & soil desiccation in certain areas.

3.4 Any accidents or spills that may have resulted in environmental contamination?

Not according to management, however a fire occurred in the metal scrap area in April 14, 1995.

3.5 Do any environmental permits exist, and if so, is the facility in compliance?

No " " " . The facility is not in compliance in the discharge of wastewater and garbage dumping, & burning

3.6 Review of the sites within one kilometer radius of the site and document other enterprises that may adversely affect the environment at the site through migration of contaminants or other mechanisms.

Facility Name	Location	Problems identified
FARM ALL AROUND		possible heavy use of fertilizers directly seep into the ground and neighboring farms.

3.7 Describe surrounding land use. Farmland

3.8 Describe all operations and processes that are now closed down. All processes are closed down until privatization takes place.

The vegetable garden used for the NITC Farms' staff is not grown any longer in fear of lack of water

4.0 MANAGEMENT / DOCUMENTATION OF POTENTIALLY HAZARDOUS MATERIALS

4.1 Are any potentially hazardous raw materials or products stored and/or used onsite?

(Y) N List

Substance	Quantity	Use	Lgth of Storage
SUPONA	500 LITERS	CATTLE DIP	MAX. OF 3 MONTHS
DELTAMETRINE	10 LITERS	"	4

4.2 Have there every been any incidents or accidents (spills, fires, injuries, etc) involving any of these materials?

(Y) N Describe Recent fire at metal scraps yard and the Easter mechanic worker fell in the dip tank a year ago.

4.3 Are incompatible materials segregated and labelled?

(Y) N Describe According to management

4.4 Are pesticides stored or used onsite?

(Y) N List They were used in the past, but none here observed.

4.5 Based on management knowledge, are there asbestos containing materials onsite?

(Y) N U Describe In the poultry houses construction.

4.6 Describe, in general, the level of environmental safety measures and practices at the site.

There is no environmental safety plan in place. There are no fire extinguishers. Only safety measures are overall and boots and gloves during the mixing of the dip baths and the spraying of cattle.

4.7 Review of records from the facility's Maintenance Department for documentation of releases of potentially hazardous materials.

Not available

4.8 Review of any additional information and documentation concerning areas of environmental concern.

Not available

5.0 AIR EMISSIONS

5.1 Total number of plant emission sources (stacks and vents) exhausting to the atmosphere.

None. Not applicable

5.2 Type of emission and discharge cycle from each source.

Source	Emission	Cycle (continuous, batch)
	Not applicable	

5.3 Is there an air emission monitoring program?

Y (N) Describe

5.4 Is there another source of air pollution nearby?

Y (N) Distance Describe

5.5 Describe emissions in detail if applicable.

Not applicable

6.0 WATER / WASTEWATER DISCHARGES

6.1 Describe all sources and volumes of wastewater / effluent. List composition of wastewater.

Source	Volume	Composition
SANITARY WASTE / SEWAGE:		
MANAGER'S HOUSE	NOT KNOWN	SANITARY WASTE
PIT LATRINE'S FARMWORKERS	"	"

6.2 Do chemical quality data exist for these sources? If yes, attach the results or describe the data.

Y (N)

6.3 Does wastewater collection system combine different sources? (process + laboratory + non-contact cooling + sanitary + storm)? Where does this effluent discharge?

Y (N) Describe Any wastewater or chemical "wash-off" from animals goes directly into the pond.

6.4 Is wastewater treated? If yes, describe the process:

Y (N) Describe

6.5 Does the facility have a pretreatment plant?

Y (N) Describe type of pretreatment

6.6 Has wastewater ever been discharged to onsite lagoons, leach (soak away) fields, septic systems, spray irrigation, or other system?

(Y) N Describe Leach fields used for the manager's house and pit latrines directly into ground.

6.7 Is the wastewater treated by the City Council and does this facility have limitations on quantity or quality of effluent that it will accept?

Y (N) Describe

6.8 Do any wastewater / effluent permits exist?

Y (N) Describe

6.9 Has the facility ever been inspected by permitting authorities?

Y (N) Describe

6.10 Are there restroom facilities onsite and if so, do they discharge to a septic field or other system. What type of system?

(Y) N Describe Leach field and pit latrines for sanitary wastes.

6.11 Have any of these systems ever been cleaned or filled?

Y (N) Describe frequency of clean / fill

7.0 WASTE HANDLING, STORAGE, TRANSPORTATION, AND DISPOSAL

7.1 List the facility solid wastes that are not known to be potentially hazardous (trash, scrap metal, palettes, etc)

Waste Type	Amount Generated
POULTRY DROPPINGS & LITTER	not known / recycled into cattlefeed
OFFICE & RESIDENCE'S WASTE	" / BURN OF WASTE
SCRAP METAL	"

7.2 Where are the non-hazardous wastes stored and disposed of?

Poultry droppings and litter were recycled into cattlefeed. Office and residential waste is burn at the site after a certain period of being disposed in an open area.

7.3 Does the facility currently generate, store and / or dispose of potentially hazardous wastes?

(Y) N

The cattle dips are stored in the storage area next to the workshops.

7.4 In the past, has the facility ever generated, stored or disposed of any potentially hazardous wastes? (Include onsite lagoons, landfills, incinerators or treatment systems.)

(Y) N Unknown

- Hydrocarbons from the vehicle maintenance workshop area.
- Potential " wash-off from dips and pesticides sprayed / applied by hand to cattle.
- Disposal of garbage and later burning. ~~activities~~.
- Fertilizers / Chemicals used under previous ownership's activities.

7.5 With regard to 7.4 above, inventory of facility wastes (now or in the past) that are potentially hazardous.

Waste Type / Storage	Amount Generated
Lubricants Presently, very little used for 2 cars	
Oils (transformer, hydraulic) Presently, oils for only 2 cars	
Solvents, degreasers None	
Pesticides / Herbicides In time when farm was in operation	Pesticides (packaging for < 10kg & [illegible] insecticids/20L/year - packaging & [illegible] CATTLE DIPS: SUPONA 500 LITRES " " " DELTAMEIRINE 10 " " " "
Paints, thinners none	
Organic Fertilizers / Feeds During previous ownership, heavy use of fertilizers. During operation NIEC used feeds for cattle	no waste/recycling per year.
Process wastes (sludges, plating wastes, still bottoms, etc)	
Other waste storage or disposal Sanitary waste leaded fuel	Could potentially affect groundwater

7.6 Does the facility treat, or has it ever treated, potentially hazardous waste on site?

Y N Describe

7.7 Is the facility licensed to treat these wastes?

Y N Describe license

7.8 Is there any waste analysis plan in effect, including sampling / analyses prior to treatment, storage and / or disposal?

Y N Describe

7.9 Are potentially hazardous wastes shipped offsite?

Y N Identify shipper and destination of wastes

7.10 Are any waste materials recycled or reused onsite?

Y N List wastes and recycling processes

poultry waste recycled into the cattle feed.

8.0 STORAGE TANKS

8.1 Inventory of storage tanks (aboveground and underground)

Tank ID	Tank Size (M3)	Tank Material	Material Stored	Tank Age
WATER TANKS (2)	5,000 GALL	IRON SHEETING	WATER	20 YEARS

8.2 Are leak detection systems or groundwater monitoring systems employed?

Y N Describe

8.3 Do the tanks meet any design requirements?

Y N Describe

8.4 Have any tanks been pulled or abandoned?

Y N Describe

9.0 POLYCHLORINATED BIPHENYLS

9.1 Have transformers ever been used onsite?

Y N Describe

9.2 Have hydraulic or heat transfer oils ever been used on site?

Y N Describe

9.3 Has any transformer, hydraulic, or heat transfer oil ever leaked or been spilled?

Y N Describe

9.4 Has a survey ever been made to determine the presence or absence of PCB or PCB-contaminated oil in any operating or scrap units?

Y N Describe ZESCO INSPECTS 1x EVERY 3 MONTHS & SERVICING IS DONE ON A REGULAR BASIS BUT DO NOT KNOW ABOUT PCBs

10.0 RADIOACTIVE MATERIALS

10.1 Are any wastes generated onsite which contain radioactive materials?

Y N Describe

10.2 Are radioactive materials disposed of onsite or offsite?

Y N Describe disposal methods, containment etc

11.0 NOISE

11.1 Does the facility generate high levels of noise?

Y N Describe

11.2 Have there been any complaints regarding noise from neighbours?

Y N Describe

12.0 EMERGENCY PLANS

12.1 Does the facility have an Emergency Plan covering environmental emergencies and involving local authorities?

Y (N) Describe

12.2 Does the facility have an emergency response team?

Y (N) Describe

13.0 ENVIRONMENTAL SETTING

13.1 Describe topography (flat terrain, valley, vegetation). Flat terrain bordered on the eastern side of farm by Chongwe River where vegetation is greener and more lush. This E side has dambos during rainy season.

13.2 Soils / geology Clayey soils. Believe to be Basement Complex

13.2.1 Have soil borings and sampling activities ever been conducted? If yes, how many and describe:

Y (N) Unknown

13.2.2 Is there any observed soil contamination at the site?

(Y) N Unknown From previous tobacco and maize operations there's discoloration and lack of vegetation in some spots to the east of the property close to the Chongwe River.

13.3 Groundwater / hydrogeology

13.3.1 Depth to groundwater approximately 30 meters

13.3.2 Is there evidence that groundwater is affected by pollution? No, but where the soil is affected and there is lack of vegetation, groundwater is suspected of potentially being affected

13.3.3 Location of all operating and abandoned onsite wells (provide map if possible). See Facility Map provided by NIEC

Borehole no. 1 is dried up and abandoned.
" no. 2 is in operation.

13.3.4 Well / borehole information (all operating and abandoned wells / boreholes).

Well	Date Installed	Diameter	Depth	Pump rate	Yield per day
Borehole No 1	Prior to 1990	±3-4" Ø	25 m	(5-10,000L/Day)	NO YIELD-Dry
? (near Mzi's house)					
Borehole No. 2					
(near Dip Bath)	"	"	30 m		10,000L/Day, but down ±25% from 1990 yields

13.3.5 Have any groundwater samples ever been taken and analyzed?

Y (N) U If yes, provide most recent results

13.3.6 Have any groundwater studies been carried out? (ie pumping tests etc)

Y (N) U Are they available?

13.4 Site drainage and surface water

13.4.1 Are there any surface water bodies known to be contaminated by any source in this area?

(Y) N Describe CHONGWE River to the East affected by THE NGWERERE

13.4.2 How is rain / storm water collected, where does it flow, and is there flooding during the rainy season? Rain / storm water flows into the ground. During rainy season there are dambos / marshes occur on the Eastern side of the farm

13.4.3 Any potential for adverse impacts to stormwater runoff due to operations or waste management practices at the facility? Yes, potential problems at the workshop area, dip bath and "wash-off" of pesticides (fungicides) from cattle during the rainy season.

13.4.4 Is there potential for rain to fall directly onto chemicals or other materials that might have an effect on soils or groundwater? Yes, at the dip bath and from the chemicals on cattle. Possible problem from fertilizers at other farms nearby.

14.0 SUMMARY OF ATTACHMENTS REQUESTED
Check items received

Site maps of the facility identifying buildings, structures, and drainage details for inclusion in our report

(Y) N

Aerial photographs

(Y) N

Process flow diagrams for each process at the facility

Y N not applicable (N/A)

Materials/Chemical inventory listing including quantities stored onsite, onsite use, and monthly usage and disposal rate

Y (N)

Copies of all environmental permits (discharge, etc.)

Y (N) N/A

Data concerning any releases or spills of materials/chemicals at the facility

Y (N) N/A

Address and type of industry listing of enterprises neighboring your facilities

(Y) N FARMS

Copy of laboratory analyses of process waste streams (liquid and solid)

Y (N) N/A

Underground storage tanks; construction details, number, capacities, and use

Y (N) N/A

Any information about the geologic and groundwater conditions at the facilities (i.e. soil types, depth to groundwater, onsite wells including depth, production, construction details, and groundwater laboratory analyses, etc.)

(Y) N included in report.

15.0 ADDITIONAL COMMENTS AND SKETCH OF SITE

Site plan provided from the survey finished in March - April 1957.

Appendix F
FACILITY RECORDS

NIEC Farms
Aerial Photograph
September 1971
1:30,000