Eskom	Standard	

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1. Introduction

Eskom Holdings SOC Limited supports government's commitment to waste management ensuring the protection of South Africa's environment. This is defined specifically in the National Waste Management Strategy (NWMS) of 2011, the National Environmental Management Act, 1998 (Act 107 of 1998) and National Environmental Management Waste Act, 2008 (Act 59 of 2008), as amended, and the regulations thereunder, not excluding other relevant environmental legislation and international agreements to which South Africa is a party.

Eskom Holdings SOC Limited will practice the five environmental management principles in line with NEMA (107 of 1998)

a) Duty of care - Waste must be avoided, minimised, reused or recycled or otherwise disposed of in a responsible manner. The generator of a waste is responsible for the fate of the generated waste in all circumstances. The generator remains legally liable for any harm to humans, to damage to property or deterioration of the environment. Cradle to grave- responsibility for the waste and the considerations of the waste exist throughout its life cycle

b) Polluter pays principle – any organisation causing pollution is liable for the costs of cleaning it up.

c) Precautionary principle – Prevention of harm is the best method of environmental protection and when knowledge is limited, apply the precautionary approach. Always assume that waste is hazardous until shown to be safe: Take action to avoid the possibility of irreversible environmental harm

d) Preventative principle – reduce risk by collection, treatment and disposal to take place as near as possible to the point of generation as is technically and environmentally feasible.

e) Proximity principle - Waste should be managed and disposed of as close to the point of generation as possible. The objective is to minimise transport distances and cost, exposure and risk associated with waste

This standard is necessary to provide the minimum management requirements of waste streams that can pose a significant risk to Eskom Holdings SOC Limited.

2. Supporting Clauses

2.1 Scope

The scope of this document covers the minimum requirements that must be adhered to for the management of the waste streams identified herein. It therefore does not relieve any employee in any way from any of his/her legal responsibilities in respect of the environmentally sound management of all other waste streams resulting from business activities not addressed in this standard.

2.1.1 Purpose

This standard aims to provide the minimum management requirements of waste streams that can pose a significant risk to Eskom Holdings SOC Limited.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings SOC Limited and entities wherein Eskom has a controlling or influencing interest.

2.1.3 Effective date

This Standard will be effective from date of authorisation.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] Environmental Indicator Reporting Standard,32-249

[3] Safety, Health, Environment and Quality (SHEQ) Policy, 32-727

[4] SANS 0290: 2008: Mineral oils – management and handling of PCB

[5] Polychlorinated Biphenyl Phase out standard, 32-1135

[6] Requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles, 32-303.

[7] Minimum Requirements for the handling, classification and disposal of Hazardous Waste (DWAF), version 2 of 1998.

[8] National Environmental Management: Waste Act, 2008 (Act 59 of 2008)

[9] SANS codes for transportation of hazardous waste -10228 to 10234, 10206, 10265 at minimum.

[10] Environmental, Occupational Health and Safety Incident Management Procedure, 32-95.

[11] National Waste Information Regulations, August 2012

[12] Waste classification and management regulations: GN R 634, 23 August 2013

[13] List of waste management activities that have, or are likely to have, a detrimental effect on the environment: GN 921, 29 November 2013

[14] National norms and standards for the storage of waste: GN 926, 29 November 2013

[15] National Environmental Management: Waste Amendment Act 2014, (Act 26 of 2014).

2.2.2 Informative

[1] Basel Convention on the trans-boundary movement of hazardous waste

[2] Environment Conservation Act (ECA),1989, (Act 73 of 1989)

[3] SANS ISO 14001 Environmental Management System: Requirements with guidance for use

[4] Kyoto Protocol on the removal of greenhouse gases
[5] Montreal Protocol on the removal of ozone depleting substances
[6] National Environmental Management Act (NEMA),1998 (Act 107 of 1998)
[7] National Waste Management Strategy (NWMS) of 2011
[8] Stockholm Convention on the identification and removal of persistent organic pollutants
[9] Rotterdam convention on the banning of hazardous substances
[10] Montreal Convention, the phase-out of ozone depleting substance
[11] Eskom's Procurement and Supply Chain Management Procedure, 32-1034.

2.3 Definitions

2.3.1 Asbestos containing material means material which contains or is likely to contain regulated asbestos fibres.

2.3.2 Colour coding means the use of colour on a container or bag or the label attached to such, that serves to identify the category of waste that it contains.

2.3.3 Contaminant means any substance present in an environmental medium at concentrations in excess of natural background concentrations that has a potential to cause harm to human health or the environment.

2.3.4 Contaminant means any substance present in an environmental medium at concentrations in excess of natural background concentrations that has a potential to cause harm to human health or the environment.

2.3.5 Disposal means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

2.3.6 General waste means waste that does not pose an immediate hazard or threat to health or to the environment, and includes—

a) domestic waste;
b) building and demolition waste;
c) business waste;
d) inert waste or
e) any waste classified as non-hazardous waste in terms of the regulations made under section 69 of NEMWA

2.3.7 General waste storage facility means a storage facility that has a capacity to store in excess of 100m3 of general waste continuously.

2.3.8 Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

2.3.9 Hazardous waste storage facility means a storage facility that has a capacity to store in excess of 80m3 of hazardous waste continuously.

2.3.10 Health care general waste means the non- hazardous portion of the waste generated at the health care facility. This is any waste that comprises uncontaminated plastics, paper, flowers cardboards or food residues.

2.3.11 Health care risk waste means the hazardous portion of the waste generated at the heath care facility. This is any waste that poses a hazard to human health or the environment.

2.3.12 PCB contaminated material means oil or articles with PCB concentration greater than 51mg/kg but less than 500mg/kg.

2.3.13 PCB material means oil or articles with PCB concentration greater than 500mg/kg.

2.3.14 PCB waste means waste as defined in the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), which contains PCB materials or PCB contaminated materials; and "SANS 290" means the latest edition of the South African National Standards for Mineral insulating oils Management of polychlorinated biphenyls (PCBs).

2.3.15 Recycle means a process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.

2.3.16 Remediation means the management of a contaminated site to prevent, minimise, or mitigate harm to human health or the environment.

2.3.17 Re-use means to utilise the whole, a portion of or a specific part of any substance, material or object from the waste stream for a similar or different purpose without changing the form or properties of such substance, material or object.

2.3.18 SANS 10234 – means the latest edition of the South African National Standard Globally Harmonised System of Classification and Labelling of Chemicals.

2.3.19 Temporary storage means a once off storage of waste for a period not exceeding 90 days.

2.3.20 Waste means

a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Act (NEMWAA, 2014); or

b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—

i. once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

ii. where approval is not required, once a waste is, or has been re-used, recycled or recovered;

iii. where the Minister has, in terms of section 74 of NEMWA, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or

iv. where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

2.3.21 Waste disposal facility means any site or premise used for the accumulation of waste with the purpose of disposing of that waste at that site or on that premise.

2.3.22 Waste transfer facility means a facility that is used to accumulate and temporarily store waste before it is transported to a recycling, treatment or waste disposal facility.

2.3.23 Waste classification means establishing, in terms of SANS 10234

a) whether a waste is hazardous based on the nature of its physical, health and environmental hazardous properties (hazard classes), and

b) the degree or severity of hazard posed (hazard categories);

2.3.24 Waste generator means any person whose actions, production processes or activities, including waste management activities, results in generation of waste;

2.3.25 Waste manager means any person that re-uses, recycles, recovers, treats or disposes of waste;

2.3.26 Waste transporter means any person who conveys or transfers waste (a) between the waste generator and a waste management facility; or (b) between waste management facilities.

2.3.27 Waste manifest system means a system of control documentation, which accompanies a load of hazardous waste transported from the point of generation to the waste management facility.

2.4 Abbreviations

Abbreviation	Explanation
ACM	Asbestos containing material
ACW	Asbestos containing wastes
CCP	Coal Combustion Products
CoE	Centre of Excellence
CFL	Compact fluorescent lamps
ESC	Environmental Steering Committee
FGD	Fluidised Gas Desulphurisation
GG	Government Gazette
GN	Government notice
HCW	Health care waste
HCGW	Health care general waste
HCRW	Health care risk waste
ISO	International organisation of standards
ODS	Ozone depleting substances
PCB	Polychlorinated biphenyl
PED	Primary Energy Division
POPs	Persistent organic pollutants
SANS	South African National Standard
SAWIS	South African Waste Information System
SOC	State owned company

2.5 Roles and Responsibilities

- The Waste Centre of Excellence is responsible for the development and monitoring the implementation of this standard.
- The Operating Units are responsible for implementation of this standard.

2.6 Process for Monitoring

The process as set out in this standard shall be subjected to audits as undertaken by the Operating units and Centre of Excellence themselves for verification of data and adherence to procedures, and internal audits by processes employed by Assurance and Forensics, and external audits as required for assurance purposes.

2.7 Related/Supporting Documents

[1] Waste Reporting Template: 240-47176064

[2] PCB Inventory Template: 240-51752992

[3] Spill Assessment Table: 240-47176039

[4] Spill Feedback Form: 240-47176095.

3. Document Content

Waste management comprises the full range of activities that accompany custodianship and disposition of waste from the point of generation to the point of final disposal. It embraces all aspects of waste handling (re-use, reduce, recycle and recover), storage, treatment, transportation and its disposal. The requirements below contain specific extractions from the Act as areas where special attention need to be given to within Eskom. This does not relieve the reader of this document from the legal obligations under the omitted sections and complying with the new legislation that comes into effect after the publication of this Standard.

3.1 General Minimum Requirements

a) Waste management in Eskom shall be managed according to this Standard

b) Waste must be stored, handled, transported and disposed of in accordance with minimum measures stipulated in Appendix A of this procedure

c) Only permitted /licensed waste disposal facilities shall be used. This also include Eskom owned waste sites

- In order to determine the correct disposal method for industrial waste, all potentially hazardous industrial waste must be classified in accordance with the Waste classification and management regulations: GN R 634.
- Personnel involved in waste management must be appropriately trained in all aspects of waste management.
- At a minimum, a waste register including the waste types, quantities disposed of, quantities recycled, disposal destinations and safe disposal certificates, must be kept.
- Audits/Waste reviews shall be conducted at appropriate intervals as determined by the Operating Units. These shall include waste contractors and commercial waste facilities.

- All waste contractors will be required to provide Eskom with a waste manifest detailing the transportation type of waste disposed of, the quantities disposed of and how and where the waste was disposed of and a certificate of safe disposal. Eskom must also provide waste manifests to the waste transporter for all the waste transported to the waste manager. The transport of waste shall be in accordance with National legislation. See the contractor requirements in Appendix B
- Records of waste must be maintained in accordance with applicable legislation (refer to Appendix P).
- To ensure waste management activities in Eskom are undertaken in a controlled manner, practices and resources shall be in place. Each Division is required to compile a waste management plan in accordance to the requirements stipulated in Appendix C
- Waste reporting to be done in accordance with the waste reporting template in Appendix K of this Standard by the Divisions.
- Waste reporting, in accordance with South African Waste Information System (SAWIS), will be done by the Waste Centre of Excellence
- Waste management practices of waste streams that can pose a significant risk shall be, at minimum, according to the processes described within the Appendixes contained in this standard.

4. Acceptance

This document has been seen and accepted by:

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5. Revisions

Date	Rev.	Compiler	Remarks
July 2015	3	Beverley Monametsi	Review of contents and update to new legislation and other requirements
September 2011	2	Beverley Monametsi and Waste Task Team	Review of contents and update to new legislation and other requirements
April 2009	1	Iris Cloete	Review of contents and update to new EDC format
June 2006	0	Waste Management Forum	New document in terms of policy review process

6. Development Team

The following people were involved in the development of this document:

- Beverley Monametsi – Waste CoE and Generation Division
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7. Acknowledgements

Thank you to all ESC, development team and the EDC staff members who relentlessly worked to ensure that the document is adequately compiled and representative of the Eskom business.

Appendix A : Minimum Requirements for Storage of Waste

A.1 General and hazardous waste excluding Health Care Risk Waste

a) A waste storage facility must be registered with the competent authority prior to the construction taking place.

b) There is no need to conduct a basic assessment and obtain a waste management license anymore when establishing a waste storage facility

c) Storage areas must be located in such a manner that it can provide optimum handling and transportation of waste material

d) All storage facilities must be located in areas accessible by emergency response personnel and equipment.

e) The waste storage facilities must be constructed and developed under the supervision of a registered professional engineer

f) The liquid and hazardous waste storage areas, must have firm, impermeable, and chemical resistant floors and a roof or a container that is coated to prevent direct sunlight and rain water from getting in contact with the waste

g) A liquid waste storage facility must have an interception trench with a sump for intercepting and recovering potential spills.

h) The liquid waste storage area must have a secondary containment system (e.g. bund, drip tray) of sufficient capacity to contain at least 110% of the maximum contents of the storage facility.

i) A waste storage facility must have effective access control to prevent unauthorized entry

j) All the Business/Operating Units must have a colour coding system to designate different types of waste and document it

k) Waste must be sorted at source into various categories and a documented procedure must be implemented to prevent any mixing of hazardous and general waste.

l) The containers in which waste is stored must be intact and not corroded or in any other way rendered unfit for the safe storage of waste;

m) Adequate measures must be in place to prevent accidental spillage, or leakage, and in the case of an incident, adequate mitigation measures are in place to mitigate, and to prevent re-occurrence of the incident;

n) Skips/bins must be closed to prevent the waste from being blown away, or rain entering and increasing volume of waste;

o) Hazardous waste must be stored in covered containers and only open when waste is added or emptied

p) Nuisances such as odour, visual impacts and breeding of vectors must be prevented from arising;

q) Pollution of the environment and harm to health must be prevented by not

- disposing waste or permit waste to be disposed of on (any land, water-body or at any facility);

- throwing, dropping, depositing, spilling or in any other way discarding any litter into or onto any public place, land, vacant erf, stream, watercourse, street or road, or on any place to which the general public has access, except in a container or a place specifically provided for such disposal;
- disposing of waste in a manner that is likely to cause pollution of the environment or harm to health and well-being (e.g. the burning or burying of waste);
- disposing of unclassified waste and
- using unlicensed/unpermitted waste disposal facilities for Eskom waste.

r) Ensure that Safe Disposal Certificates are retained for hazardous wastes that has been disposed of

s) Training must be provided continuously to all employees working with waste and to all contract workers that might be exposed to the waste.

t) Each waste storage facility must be able to provide documentation verifying the number of waste storage containers or tanks within the facility, date of collection and authorized collector or collectors and proposed final point of treatment, recycling or disposal

A.2 Health Care Risk Waste Storage

a) All reusable containers must be effectively disinfected before re-use and meet the standards specified in SANS10248:2004 standard

b) The floors of the storage facility must be cleaned and disinfected twice a day.

c) A lid used for a pathological waste container or a disposable sharps container must provide an airtight seal to prevent the emission of odours and be secured in such a way that it cannot be reopened once closed.

d) Sharps must be contained in rigid, puncture-proof, tamper-proof and clearly marked containers.

e) Plastic bags used as stand-alone containers must have a thickness of 80 um or more.

f) Plastic bags used as liners which form an integral part of a rigid container must have a thickness of 60um or more.

g) A generator must store healthcare risk waste other than pathological waste, sharps and pharmaceutical waste for not more than 30 days from the date of generation.

Appendix B: Transport Contactors Requirements

Where contractors are used the onus lies on the waste generator to ensure that the required information is correctly filled out on the waste manifest. Waste will be transported in accordance with the obligations imposed on the “operator” and “driver” by GN R 225 to the National Road Traffic Act of 1996, including the associated SANS 10228,10229,10231,10406 and 10206 Codes of Practice. Waste contractors transporting hazardous waste will be required to provide Eskom with the necessary documents to proof that they are permitted to handle and transport the waste and with a certificate of safe disposal.

- Waste transporters must be registered to do so with the National or Provincial Governments. A registration certificate must be provided as evidence
- The waste generator (Eskom or any person working on behalf of Eskom)) must provide the transporter with accurate information about the nature and properties of the load.
- The waste generator (Eskom or any person working on behalf of Eskom) must provide the transporter with the relevant transportation documentation (as mentioned under normative references) for the consignment.
- The load must be properly loaded and secured on site prior to transportation.
- The transport operator must have Hazchem placards on his vehicle.
- The transport operator must ensure that the Hazchem placards are properly fitted to the vehicle.
- The Responsible Person must ensure that before the vehicle leaves the consignor's premises it is not overloaded or showing any obvious defect that would affect its safety.
- The Generator - or his representative, i.e., transporter - must ensure that adequate steps are taken to minimise the effect an accident or incident may have on the public and on the environment.

All contracts must contain the following declarations:

a) signed by the consignor: "I hereby declare that the content of this consignment is fully and accurately described above by the proper shipping name, and is classified, packaged, marked and labelled, and is in all respects in proper condition for transport in accordance with the relevant national legislation.";

b) signed by the driver: “The consignment above has been received into my vehicle. My vehicle is correctly labelled and I am in possession of all necessary transport documentation pertaining to the transport of dangerous goods, including the procedure to be followed in the case of an emergency”

c) signed by waste disposal facility: “I hereby declare that I am permitted by law to receive this waste and can deliver the services to dispose of the waste in an environmentally sound manner”.

Appendix C: Industry Waste Management Plans (IndWMP)

C.1 Industry Waste management plans shall be developed and implemented to meet the requirements for these general duties in respect of waste management:

a) Avoid the generation of waste. Where such generation cannot be avoided, minimise the toxicity and amounts of waste that are generated;

b) Identify all waste streams that arise from the activities of the business;

c) Reduce, re-use, recycle and recover waste as a first priority before disposal;

d) Where waste must be disposed of, ensure that the waste is pre-treated and disposed of in an environmentally sound manner;

e) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

f) Prevent any employee or person, under his or her supervision from contravening applicable environmental legislation; and

g) Take reasonable measures to prevent the waste from being used for an unauthorised purpose.

C.2 The industry waste management plans will at minimum contain the following information:

a) the amount of waste that is generated;

b) measures to prevent pollution or ecological degradation;

c) targets for waste minimisation through waste reduction, re-use, recycling and recovery;

d) measures or programmes to minimise the generation of waste and the final disposal of waste;

e) measures or actions to be taken to manage waste;

f) the phasing-out plans of the use of specified substances(e.g. persistent organic pollutants like PCB, asbestos, ODS);

g) opportunities for the reduction of waste generation through changes to packaging, product design or production processes;

h) mechanisms for informing the public of the impact of the waste-generating products or packaging on the environment;

i) the extent of any financial contribution to be made to support consumer-based waste reduction programmes;

j) the period that is required for implementation of the waste management plan;

k) methods for monitoring and reporting;

l) the waste class and rating in order to determine the correct disposal method for the waste; and

m) any other best practise that may be necessary to give effect to the requirements of NEM:WA and regulations passed thereunder.

Appendix D: Coal Combustion Products

D.1 Introduction

Coal Combustion Products (CCP) is the collective term for all resides arising from the combustion of fossil fuels. This includes products from the boiler itself as well as the air pollution abatement equipment installed. An array of such products, each with its unique characteristics, have evolved over the past 40 years as power utilities adapted their technology to comply with legislation introduced to ameliorate the impact of coal combustion. Included amongst these are fly ash, bottom ash, various types of flue gas desulphurisation products like gypsum, ammoniated fly ash, high carbon fly ash from low NOx burners and Hg capture, fluidised bed combustion residue, etc. Currently, Eskom CCPs are entirely fly ash and bottom ash. The flue gas desulphurisation technology to be employed at the new build power stations such as Kusile and Medupi, will add gypsum to the list of CCPs.

Ash

A modern coal fired power station with a total output of 3600MW will consume ± 50 000 tons of coal every day. Depending on the coal quality, the calorific value (heat content) and ash content, stations can produce ± 17 000 tons of ash per day. Almost 90% of the ash produced in the generation process is called fly ash or pulverised fuel ash. The reason for this is that the coal is pulverised into a very fine dust before being fed into the boilers to ensure efficient combustion. Larger particles of ash, called coarse ash, which make up the rest of the ash produced at the power station, drop down from the furnace and collect at the bottom in the ash hopper of the boiler.

Approximately 1.2 million tons of ash per year is sold to, amongst others, the cement industry where the ash is used as a cement extender. The ash consists of very fine, spherical particles and has an almost zero carbon content, high pozzolanic activity (or reactivity), and unusually high consistency. Fly ash is successfully used to enhance the quality and economy of concrete. Uses of fly ash include brick making, dam building and as a cement extender during the manufacturing of cement. Approximately 250 000 tons of ash from Lethabo Power Station, for instance, was exported to Lesotho for the Katse Dam project.

What fly ash Eskom does not sell on site is stored in ash dumps or dams, which are controlled via the lining of trenches, monitoring of ground water and rehabilitation of top soil, but there is a risk of pollution.

Gypsum

The potential requirement to adhere to more stringent limits on the gaseous emission necessitates the removal of SOx (oxides of sulphur) from flue gases during coal combustion. Subsequently, all new stations will include Flue Gas Desulphurisation technology. This technology, requires the introduction of a sorbent (usually limestone or dolomite), to reduce the amount of SO2 that is emitted. Calcium from the limestone reacts with the SO2 to form calcium sulphite or calcium sulphate and CO2.

A by-product of the FGD process is gypsum. Gypsum has a commercial value and could be sold on the market demand for such a product is currently been determined by the Supply Chain Operations (Commercial department).

A study has been initiated to investigate the potential opportunities which will result in the use of this resource. Initial findings indicate that construction and agriculture are the most suitable sectors for gypsum commercialisation. It can be used for the manufacture of wallboard, plaster and screeds, set retarder for Portland cement and for soil stabilisation; however, the use depends on the nature, composition and the properties of gypsum.

Eskom will continue to engage with industry to promote the use of CCP's and set internal targets to encourage additional uses. This will be done in conjunction with the current key role players in the market and will take into consideration Eskom's strategy around Supplier Development and Localisation with the specific focus on Black Woman Owned (BWO) companies.

D.2 Legislative requirements

The Regulations under the ECA as published in GN 1986 in GG 12703 of 24 August 1990 and as amended by GN 292 in GG 24938 of 28 February 2003 expressly exempted ash produced by or resulting from activities at an undertaking for the generation of electricity under the provisions of the Electricity Act No. 41 of 1987, as being classified as waste. There was thus no obligation for Power Stations to obtain a permit to dispose of ash or to operate a disposal site for ash. At the time of construction of the currently operational Power Station's ash dams and dumps, ash did not meet the legal definition of 'waste' and did not require a ECA section 20 (1) permit.

NEM:WA has subsequently included ash in the definition of waste. However, Government Notice 921 of 29 November 2013, 7(1) provides that "a *person who lawfully conducts waste management activity listed in this Schedule on the date of coming into effect of this Notice, may continue with such activity until such time that the Minister by notice in a Gazette calls upon such a person to apply for waste management licence."* Currently, existing lawful waste management activities do not have to undergo an EIA process or be licensed, until directed so by the Minister, as per the transitional provisions in section 82 of the NEMWA.

Ash disposal facilities are seen as Section 21(g) water use activities ("disposing of waste in a manner which may detrimentally impact on a water resource"), i.e. they are regarded as an activity that has a potential to negatively impact water resources. All water use activities need to be licensed in terms of section 21(g) of the National Water Act; this will also apply to gypsum if some of it is going to be dumped at the power station.

D.3 Environmental Impacts of Coal Combustion Products

Fly ash material solidifies while suspended in the exhaust gases and is collected by electrostatic precipitators or filter bags. They consist mostly of silicon dioxide (SiO_2), which is present in two forms: amorphous, which is rounded and smooth, and crystalline, which is sharp, pointed and hazardous; aluminum oxide (Al_2O_3) and iron oxide (Fe_2O_3).

Fly ash, like soil, contains trace concentrations of many heavy metals that are known to be detrimental to health in sufficient quantities. These can leach into the ground or surface water and cause contamination. These elements are however, found in extremely low concentrations in fly ash.

Flue gas desulphurization drastically removes sulphur dioxide from chimney emissions. Sulphur dioxide is a colourless gas produced when fossil fuels like coal and oil are burnt. It is extremely harmful to the environment and one of the main chemicals that can cause acid rain. Sulphur dioxide is harmful to plants and can damage trees. If sulphur dioxide emissions are cut down with the use of technologies such as flue gas desulphurisation, we will strive one-step closer to a clean environment.

D.4 Management requirements

1) Implementation of effective measures to prevent ground water pollution by ensuring no leachate pollutes ground water.

2) Groundwater monitoring is to be done at and around the ash dams and dumps. Reviews of groundwater monitoring results shall be undertaken. Based on the outcome, the appropriate mitigation required shall be determined to ensure avoidance and control of ground water contamination.

3) Operational procedures and/or work instructions have been developed and implemented to ensure correct management and operation of the dams/dumps. These will only need to be updated to align with all relevant legislative requirements.

4) Further research shall be undertaken to ensure that both Ash and FGD waste should be analysed and classified to bring it under environmentally sound management practices.

D.5 References

a) Factsheet: Ash Management in Eskom Rev 4, January 2008, www.eskom.co.za/mediaroom/publications/factsheets

Appendix E: Fluorescent Tubes, Compact Fluorescent Lamps (CFLs) and Mercury-Containing Devices

E.1 Introduction

Mercury-containing lamps and devices contain small quantities of mercury, cadmium and antimony, and proper disposal throughout Eskom is essential. Fluorescent tubes, e.g. CFLs, contain an average of 5mg of mercury (Hg) per lamp as an essential ingredient for the generation of light. Other types may contain up to 15mg of mercury.

Due to the hazardous properties of this waste stream, this annexure sets out the approach, in accordance with the relevant legislation, to the safe handling and disposal of mercury-containing lamps and devices by both Eskom and any contractor providing waste disposal services to Eskom.

E.2 Environmental impacts

If not correctly disposed of, the mercury may leach through waste landfills and end up in groundwater. Small amounts of mercury can contaminate a sizeable water supply, thereby endangering water users. Further, the mercury vapor that is released into the environment when lamps are broken pollutes the air and poses a risk to people through inhalation. It is estimated that a single fluorescent tube contains enough mercury to pollute 30 000 liters of water.

Mercury compounds are chemically stable, thus do not readily break down over time or release the mercury into the water streams. All mercury containing waste in Eskom will be pre-treated to form such a compound when crushed and stored for final disposal.

E.3 Management strategies

E.3.1 Eskom-owned sites

- All Mercury-containing lamps and devices must be disposed of at a registered hazardous waste disposal site.
- All Eskom sites that produce bulk mercury-containing lamps must invest in a crushing facility as this allows for the easy pre-treatment of the waste and contributes to waste reduction. If an Eskom site does not have a crushing facility, the waste service provider can be contracted to crush the tubes on their behalf
- Lamp cardboard boxes, as an alternative to 210L drums, can also be used to pack the lamps. The boxes provide a safe, convenient and efficient lamp-disposal solution that improves the facility's housekeeping and reduces health and safety risks through the correct handling, transportation and disposing of lamps. The boxes will be treated in the same manner as a 210lt drums
- Smaller numbers of mercury-containing lamps and devices can be stockpiled before being crushed at a central crushing facility.
- All mercury-containing lamps disposed to the hazardous waste facility shall be pre-treated. It is illegal to dispose of untreated hazardous waste at any waste facility in South Africa.

E.3.2 Non-Eskom sites

The owner of the building is responsible for the disposal of the used mercury-containing lamps and devices like CFLs and ballasts. These disposal requirements shall be covered in the lease agreement, and the responsible Eskom person must confirm that such disposal occurs in accordance with legal and other requirements.

E.4 Management requirements

E.4.1 Pre-treatment

Crushing is the recommended pre-treatment option for use within Eskom, based on the standard operating procedure given in Appendix I.7.2 of the SANS 10114-1,2005.

E.4.2 Crushing

The crushing of whole mercury-containing lamp contributes to waste reduction and is economically more viable, than the disposal of untreated whole mercury-containing lamps due to the volume of tubes to be disposed of.

To ensure that the free mercury is adequately immobilized, the preferred specifications for a crushing unit/facility are:

- Due to the risk to the environment and health, all Eskom employees handling the disposal of used Mercury-containing lamps and devices must be trained and wear the necessary PPE. Crushing activities must be restricted to a dedicated, demarcated area. Proper ventilation is required. Appropriate breathing apparatus and safety gloves must be worn by the operator at all times. Full face protection must be worn to prevent eye injuries. The testing for mercury exposure must be included into the job specification of the employees designated to do this
- The crushed mercury-containing lamps and devices must be contained in a drum with a sealable lid and locking device. As the drum fills, the crushed content must be treated with an equivalent amount (50:50) of sulphur and sodium sulphide before the drum is disposed of at a registered hazardous waste disposal facility. Access to the drum must be controlled.

The following standard operating procedure as per the Annexure I.7.2 of the SANS 10114-1:2005 must be used for treatment for crushed mercury-containing lamps and devices in a 210l drum:

- When a 100 or more lamps have to be disposed of, the container that holds the debris should have some sulphur powder added to it. The mercury and sulphur do not normally react with each other at room temperature, but because mercury vaporizes over a long period, it will react to form mercuric sulphide. Mercuric sulphide is stable, inert and insoluble in water preventing the mercury from leaching into the water systems.
- Crushing of the fluorescent tubes constitutes treatment of waste as it changes the physical character of waste.
- When sulphur is added to the crushed tubes, a toxic component (mercury vapour) is being stabilized, making it less volatile. This is also regarded a treatment.

- The GN 921, stipulates the minimum and maximum daily thresholds (500kg but less than 1 ton) for the treatment of hazardous waste. If the Eskom's site thresholds exceed the legislative thresholds, a license will be required to crush and treat the fluorescent tubes

If the thresholds are lower, a waste license is not required at Eskom sites where the crushing and treatment of fluorescent tubes takes place.

E.4.3 Treatment

One hundred fluorescent lamps would contain about 1.5g of mercury and 100 high-pressure mercury lamps would contain about 3,0g of mercury. One compact fluorescent lamp (CFL) contains about 5mg when new, so 100 new CFLs will contain about 30mg of mercury.

Sulphur should be added in the ratio, by mass, of six mercury to one sulphur, therefore only 0,5g of sulphur is required for tubular fluorescent lamps and about 0.5mg of sulphur will be needed for CFLs.

Such a small quantity of sulphur is difficult to spread around all the debris and therefore, because sulphur is relatively inexpensive, it is therefore recommended that 250ml of sulphur be added for every 100 tubular fluorescent lamps. .

This recommendation is simple to implement and is a safe and a cost-effective method, since both the container, which may be a 210 L drum with a lid, and the sulphur are relatively inexpensive.

E.4.4 Disposal

Mercury-containing lamps collected in large quantities are considered as extremely hazardous waste, since they contain approximately 2 mg/kg of mercury. Mercury-containing lamps in large quantities or bulk must be disposed of at a registered hazardous (H:H) waste disposal site.

To return the mercury-containing lamps and devices to a central point for recycling or disposal could also create risks because the mercury-containing lamps and devices have to be handled. The lamps could break during repacking, storage and transportation, exposing the operators to the risk of contact or inhaling the mercury vapour.

Handling of the lamps new or spent should therefore be kept to a minimum putting the necessary precautionary measures in place where handling cannot be avoided.

E.4.5 Recycling

The recycling of fluorescent tubes or other mercury containing lamps has now been licensed in South Africa. This must only be done by a company that is licensed and registered to recycle hazardous waste. No companies without the legal documents will be required to do recycling of the fluorescent tubes in any of the Eskom sites.

E.5 References

a) SANS: 10114-1:2005, Annexure I.7.2

Appendix F: Oil (Hydrocarbon) Management (Normative)

F.1 Introduction

Due to the strategic nature of oils in Eskom equipment, aspects such as usage, handling, storage, transport and general control of the commodity need to be carefully managed. The purpose of this section is to communicate and ensure the correct handling, storage, transportation and disposal of material contaminated with mineral insulating (transformer) oil, or hydrocarbon.

Eskom has standardized the use of uninhibited naphthenic insulating oil in electrical equipment. This oil is also often referred to as a mineral oil.

F.2 Environmental Impacts

Insulating oil and other related hydrocarbon compounds pose a serious pollution problem once released into the environment. Not only do these compounds pose a fire hazard, but with 1 (one) litre of oil having the potential to contaminate in excess of a million litres of water, it needs to be handled with care. Oil may rapidly penetrate certain soil types, which may lead to extensive environmental as well as groundwater and surface water contamination.

F.3 Management strategies

Management will follow the requirements as listed in the SANS 290 document entitled: Mineral insulating oils (uninhibited) – Purchase, management, maintenance, testing and safe disposal.

All insulating oil removed from any electrical equipment for inclusion in the Eskom oil pool will be tested for the presence of contaminants such as PCBs, solvents and synthetic oils, including electrical cleaner, silicone oil and motor oils.

All oil (hydrocarbon) spill incidents within Eskom shall be reported electronically in line with the requirements of the EPC 32-95: Safety, Health and Environmental Incident Management Procedure.

All oil (hydrocarbon) spills shall be assessed using the Spill assessment criteria checklist (240-47176039) as a guide and feedback on the assessment based on the Spill assessment feedback form (240-47176095) at minimum, which shall be uploaded as records to the incident management system.

F.4 Management requirements

F.4.1 Spillages of oil, solvents or hydrocarbons:

All spills need to be assessed by completing the Spill Assessment Criteria checklist (240-47176039). Feedback need to be given by answering the questions on the Spill Feedback form (240-47176095). . *If the PCB levels of the oil are not known through prior testing, the spill shall be treated as a PCB spill, until such time that analysis proves otherwise. All spill incidents within Eskom shall be reported electronically in line with the requirements of the Safety, Health and Environmental management procedure 32-95.

F.4.2 Spill on an Eskom Site

F.4.2.1 Limit the spillage

The need for immediate corrective action to limit the spillage cannot be overemphasised as this will minimize the environmental damage and reduce remediation costs. This can involve actions such as:

(a) Closing a valve;
(b) Repairing the leak with rags, plugs or other appropriate material;
(c) Repositioning the container so that the leaking area is at the highest level or lifting a fallen drum/container;
(d) Placing a leaking container or equipment into a collecting tray or bund area and
(e) Collecting the spilt oil in a container located underneath the leak or channelling the leak into a container.

F.4.2.2 Containing the spillage

The containment of a spillage will involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering waterbodies such as drains, stormwater systems, dams or rivers. Containment of the oil near the source will minimise pollution and will enable easy clean-up and/or remediation. This shall be done using one or more of the following;

(a) Soil barriers;
(b) Sand bags;
(c) Bund walls and
(d) Absorbent materials.

F.4.2.3 Removal of oil

The free oil (puddles) shall be captured and put into a suitable container such as a drum or tanker for proper disposal. This oil shall not re-enter the Eskom insulating oil pool for regeneration and re-use in electrical equipment.

F.4.2.4 Final clean-up/remediation

After removal of excess oil, saw dust, suitable absorbents or solvents shall be used to complete the clean-up of the spill. This might include the removal of leaking equipment, cleaning of pavements, removing contaminated soil and vegetation as well as disposing of clean-up equipment. The absorbing material shall be bagged and disposed of at a registered hazardous waste site.

F.4.2.5 Remediation of the land

The land must be remediated to its virgin state. This must be assessed first to determine contamination. The assessment must be taken out as per requirements as set in the Norms and Standards for the remediation of contaminated land. The Norms and Standards for contaminated land stipulate a list of contaminants that need to be checked in order to confirm if land is contaminated. The contaminants include amongst others: Chromium III and IV, Lead, hydrocarbons and sulphates. If the Soil Screening Values of hydrocarbons in this case, exceeds the value stipulated in the norms and standards, it means that the land is contaminated then the land needs to be remediated. Remediation deals with the removal of pollution or contaminants from environmental media such as soil, groundwater, sediment, or surface water. If a site has to remediate the land, the method of remediation must be decided upon the site with the assistance from the Waste CoE.

F.4.3 Polychlorinated Biphenyl (PCB) Management

F.4.3.1 Introduction

Polychlorinated biphenyls are synthetic liquids with exceptionally high chemical and thermal stability. PCBs were mainly utilised as substitutes for mineral oil in high-powered electrical equipment to enhance thermal resistance. Their characteristics make them non-biodegradable, bio-accumulative and persistent organic pollutants (POPs) under the Stockholm Convention. PCBs can be found in dielectric fluid used in some electrical equipment, such as transformers and capacitors, for electrical insulation and thermal cooling.

The purpose of this section is to provide reference for the approach to the safe handling, storage, disposal and phase-out of materials contaminated with polychlorinated biphenyl.

F.4.3.2 Environmental Impacts

As PCBs are not readily biologically degradable, it tends to be passed on through the food chain, and has thus been classified a persistent organic pollutant (POPs). PCBs produce hazardous carcinogenic by-products under incomplete combustion.

F.4.3.3 Management Strategies

It is important to note that although oil and equipment at level 3 (<50 ppm) and below are considered non-PCB materials in accordance with the Stockholm Convention on Persistent Organic Pollutants, the strategy within Eskom is to ultimately work towards achieving level 0.

The management, handling and disposal of PCB will be done in accordance with the SANS 0290: 2008: Mineral Insulating Oils – Management and Handling of Polychlorinated Biphenyl (PCB). Phase-out will be done in accordance to EPC 32-1135: PCB phase-out Standard.

In line with the Stockholm Convention and Regulations to phase-out the use of Polychlorinated Biphenyls, Eskom is committed to the phasing out of PCB's. Eskom will not

1) use any PCB materials or PCB contaminated materials after the year 2023.
2) have any PCB materials, PCB contaminated materials or PCB waste in their possession after the year 2026, excluding disposed PCB waste.
   - Eskom has registered as a PCB holder in accordance to the PCB regulations. The registration number is 14/11/11/PCB/001.
   - All owners of PCBs within Eskom must develop, and maintain a PCB inventory (240-51752992) that has been accepted and signed by the employer.
   - A comprehensive PCB management and phase-out plan shall be developed by each Eskom Division for PCB's more than 50 ppm.
   - Progress on the PCB phase-out plans will be reported on a six monthly frequency as required by this procedure.
   - The PCB inventory and phase-out plan will be subject to internal or external audits as per the business requirements.
   - This section on PCB management must be read in conjunction with the EPC 240-84908008 or 32-1135: PCB Phase-out Standard, March 2015

F.5 References

a) SANS 0290: 2008: Mineral Insulating Oils – Management and Handling of Polychlorinated Biphenyl (PCB).
b) The Eskom Insulating Oil Manual: http://sivmas045.eskom.co.za/insulatingoil/
c) EPC 240-84908008 or 32-1135: PCB Phase-out Standard, March 2015

d) GN R. 549; National Environmental Management Act (107/1998): Regulations to phase-out the use of Polychlorinated Biphenyls (PCBs) materials and Polychlorinated Biphenyl (PCB) contaminated materials, 10 July 2014.

Appendix G: Asbestos Management

G.1 Introduction

Eskom Procedure “Requirements for the safe processing, handling, storing, disposal and phase out of asbestos and asbestos containing material, equipment and articles, (Ref. 32-303), under the purpose, it expresses the requirements for asbestos phase – out programs. An asbestos phase – out program refers to the removal of asbestos and asbestos containing material and/or replacement with non-asbestos material over a time period specified by the business unit in the Asbestos Phase – out plan/program.

The procedure requires under section 4.6 “Control of exposure to asbestos” that “Phasing out of asbestos refers to the removal of asbestos and asbestos containing material and/or replacement with non-asbestos material over a period of 30 years, or what is regarded as reasonable for a particular business.”

This annex deals with the disposal of asbestos and asbestos-containing materials, equipment and articles. All disposals of asbestos should be done according to section 20 of the Asbestos Regulations of 2001. For more information on the general management of asbestos and the safe processing, storage, removal and handling of asbestos-containing materials, equipment and articles, Eskom Asbestos procedure 32-303 should be used. An inventory (template 240-47175987, found in Asbestos Procedure, 32-303) of asbestos and asbestos containing materials must be kept by the owner thereof.

G.2 Environmental impacts

Asbestos containing materials were historically used for lagging and insulation purposes, especially at power stations. Being a persistent organic pollutant it is listed under the Rotterdam convention as an Appendix A chemical and has therefore been banned in South Africa for imports, exports, mining and manufacturing. It further has health effects as the inhalation of these regulated asbestos fibres causes serious lung diseases, including asbestosis, cancer of the lungs and mesothelioma. These diseases usually become apparent only some years after exposure to asbestos, and sometimes until forty (40) or more years after the first exposure.

G.3 Management strategies

Eskom’s strategy is to phase out asbestos as soon as possible but not later than November 2033.

All owners of asbestos containing materials and equipment are required to have a plan on the phasing out of asbestos.

Where there is immediate risk, asbestos should be removed and replaced by non-asbestos containing material or as part of normal maintenance.

G.4 Management requirements

G.4.1 Asbestos inventories

All asbestos and asbestos containing material (ACM) shall be identified and recorded on an inventory by the employer, in line with the Asbestos Inventory template 240-47175987. If such material does not belong to the employer, the owner should provide the inventory, but in such a case the onus is on the employer to verify the correctness and applicability of the information on the inventory. The purpose of an inventory is to establish exact locations for asbestos or asbestos containing materials on site, to reflect the assessment results of the condition of the material, and to provide supporting information for an asbestos phase-out plan.

Where one is not sure if a particular material is, or does contain asbestos, it shall be handled as if it is asbestos containing material (ACM) until such a time that it is confirmed as not containing asbestos. A swipe sample of dust collected on work surface areas, or on identified marked areas, should be collected and scanned under a Contrast Phase Microscope for recognition of the presence of asbestos fibres by an accredited laboratory.

G.4.2 Requirements for the handling and disposal of asbestos

- The management, handling and disposal of asbestos and ACM will be done in accordance with the Asbestos regulation, 2001 and the asbestos procedure 32-303.
- All owners of asbestos and ACM within Eskom will develop, and maintain an inventory that has been accepted and signed by the employer.
- All owners of asbestos and ACM will develop an asbestos and ACM phase-out plan in order to meet the Eskom phase-out date of 2033.
- Asbestos disposed of will be reported on a six monthly frequency as required by this procedure using the Waste reporting template, 240-47176064.

G.5 References

a) Eskom procedure EPC 32-303: Requirements for the Safe Processing, Storing, Removing and Handling of Asbestos and Asbestos-containing Materials, Equipment and Articles.

b) Occupational Health and Safety Act, Act No. 85 of 1993 Updated 2007

c) Asbestos Regulations, 2001

Appendix H: Health Care Risk Waste

H.1 Introduction

Health care waste (HCW) must be managed adequately in order to control the potential spread of infectious diseases that can put waste disposal workers and the public at risk. HCW comprises Health Care General Waste (HCGW), the non-hazardous component of HCW and Health Care Risk Waste (HCRW), posing a risk to human health and the environment. Eskom generates HCGW and HCRW at the various healthcare facilities it operates.

H.2 Environmental impacts

Exposure to healthcare risk waste can result in health risks to the public, patients, healthcare workers, waste managers and the environment. Waste management measures can reduce such risks substantially.

H.3 Management strategies

The following steps will be observed within Eskom to ensure cradle to grave management of HCRW

a) Segregation –

i. The HCGW must be separated from the HCRW

ii. the segregation of waste is done by the generator of waste.

iii. The doctors and nurses are primarily responsible to segregating the waste correctly

b) Containerisation –

i. There are two types of containers for HCRW, single (health facilities) and re-usable (SHE bins.

ii. The colour coding of bags for waste segregation as recommended by SANS 102148(1,2,3) is very important, red for HCRW, yellow for contaminated linen, black or transparent for HCGW

c) Intermediate(temporary) storage and weighing

d) Internal collection and transportation

e) Records and reporting

When the waste bin is full it should be sealed and the waste contractors must be called to collect.

All necessary precautions must be taken to minimise the risk of spillage of HCRW as it can become infectious, disease causing, become a nuisance by producing odours, or lead to the breeding of vectors.

H.4 Management requirements

The manager, or the person in charge of the day-to-day running of a healthcare facility, or a healthcare provider, shall:

a) retain overall responsibility for the management of healthcare risk waste in accordance with the relevant requirements and regulations of the current relevant national legislation;

b) ensure that there is a budget for the management of healthcare risk waste; and

c) be trained in the identification, classification, segregation, containerization and storage of healthcare risk waste

d) ensure that training is provided to new employees on how to manage HCW

All contractors working in healthcare facilities or collecting sanitary wastes within Eskom must comply with:

H.4.1 Contractor requirements

- Wear protective rubber gloves when cleaning or handling healthcare risk wastes. This will protect should any contact with chemicals or body fluids e. g. urine and blood occur.
- All the medical centre floors must be kept clean at all times
- All the medical centre surfaces must be damp dusted at all times
- As the medical centre deals with sick employees, courtesy and respect will be expected at all times
- Empty HCGW bins only i.e. black or clear bag lined bins, and unlined bins
- Check and ensure that soap dispensers are filled at all times
- Ensure that sufficient toilet papers and hand dry papers are provided at all times
- Report any syringes, needles, tablets, blood spills, urine spills or medicines that may be found on the floor to the Sisters in charge.
- Any spills related to HCRW should be secured from public access and reported immediately to the Sisters in charge.

H.4.2 General requirements for healthcare workers

- Empty and dispose HCRW in the correct bins e.g.
  - sharps in yellow bins recommended for the sharps,
  - Expired pharmaceutical wastes, used drugs and vaccines, used medical containers, into a green container
  - Infectious and anatomical wastes(where applicable)into red plastic bag
  - Contaminated linen into yellow plastic bags.
- Do not dispose any syringes, needles, tablets, used swaps or medicines that you may find on the floor into general waste bins.
- Do not remove any HCRW from the clinic for any reason.

H.4.3 Process for disposal and monitoring

- HCGW and HCRW shall not be disposed of by burning, dumping or burying in pits or in trenches.
- HCGW and HCRW shall be disposed of at authorized landfill sites.

- Records for awareness and disposal must be kept at each clinic of all HCW management practices.
- All records must be retrievable and accessible and must be kept for purposes of monitoring and measurement of HCRW practices.
- The healthcare facility shall retain documented evidence from the waste management practices.

H.5 References

a) SANS 10248(1,2,3) Edition 2: 2004 Management of healthcare waste

b) Environment Conservation Act, No 73 of 1989 – Gauteng Health Care Waste Management

c) Regulations, 2004

d) NEMA, 1998 (Act 107 of 1998)

e) NEMWA, 2008 (Act 59 of 2008)

f) The National Road Traffic Act (Act 93 of 1996)

g) OHSAct (Act 85 of 1993)

Appendix I: Metals

I.1 Introduction

Metals can be divided into two broad categories: ferrous- and non-ferrous metals. Ferrous metals are iron and surface-treated iron, while non-ferrous metals include copper and copper alloys, zinc, lead, aluminium, tin and precious metals such as gold and silver. Metal equipment may be coated with paints (paint may be lead-based) or PCB-containing oil, which may have separate environmental hazards of their own.

The purpose of this section is to provide guidelines for the recycling, disposal and selling of metals in a manner that promotes sustainability and prevents pollution, in line with the Eskom SHEQ Policy (EPL 32-727).

I.2 Environmental impacts

Eskom's plant and operating equipment (e.g. transformers, electrical cable, substation equipment, etc.) consist largely of metal. Once equipment is replaced or decommissioned, metal parts are either re-used, sold as scrap metal through the procurement process, or disposed of along with other materials. Scrap metal, whether sold or disposed of, is a waste stream that requires management in order to prevent environmental degradation or threats to human health and well-being.

I.3 Management strategies

The sale of an Eskom asset should be performed as per Eskom's Procurement and Supply Chain Management Procedure, 32-1034.

I.4 Management Requirements

In line with the principles of waste minimisation, scrap metal should first be reused or recycled before disposal to landfill is considered. All disposals of Eskom assets will be in compliance with the commercial policies and procedures applicable and the process approved by the approved delegated authority. Ensure that these service providers are authorised to re-use/recycle scrap metals by producing recyclers permit. The Investment Recovery Section is responsible for ensuring that contracts for the selling and the disposal of scrap metal address the matters outlined below:

I.4.1 Non-ferrous metals (copper, aluminium, etc.)

Disposals of all metals, including non-ferrous metals, must be done through the Investment Recovery Section. Sources of non-ferrous metal waste:

- Stores
- Substations and constructions camps
- Dismantling of disused lines
- Re-conducting projects

I.4.2 Scrap steel, etc. (ferrous metal)

To maximise the return of Eskom scrap returned to stores and simplify the disposal process of these commodities, local or regional annual contracts will be established by the Investment Recovery Section, covering all stores and workshops. To improve the monetary return of the sale, it is suggested that some form of sorting into the different commodities be performed, e.g.:

- Steel subgrade
- Steel heavy grade
- CTs, VTs (current transformers, voltage transformers) and switchgear
- Plastic and PVC
- Wood/general clean-up

I.4.3 Metals coated with other hazardous substances

Metal equipment contaminated with PCB-contaminated oil may not be sold. Such metal equipment must either be disposed of at a registered H: H landfill site, or be destroyed by thermal destruction.

I.5 References

a) http://www.bafu.admin.ch/abfall/01472/01486/index.html?lang=en

Appendix J: Disposal and safe handling of contaminated Sulphur Hexafluoride Gas (SF6) and its by-products

J.1 Introduction

Sulphur hexafluoride (SF6) is a colourless, odourless, non-flammable gas which is primarily used in the electrical and electronics industry as insulation in switchgear and circuit breakers as an insulating and arc extinguishing (quenching) medium.

J.2 Environmental impacts

The purpose of this section is to communicate and ensure the safe handling and disposal of SF6 gas and/or its by-products. The gas is not hazardous in itself, but readily displaces oxygen thus causing an asphyxiation risk. SF6 has been identified as a greenhouse gas (under the 1997 Kyoto Protocol) which is 22 500 times more effective in trapping infrared radiation than an equivalent amount of CO2 , and atmospheric releases must therefore be avoided. Upon combustion the SF6 forms a toxic array of by-products.

J.3 Management strategies

J.3.1 In the event of an SF6 leakage:

- Evacuate the affected areas and report any incident to the Responsible Manager of the unit/area immediately.
- Remove sources of heat and electrical arcing. Provide adequate ventilation by ventilating the area until the air/oxygen levels are normal (a minimum volume of 18 % O2).
- Carry out air quality monitoring with calibrated measuring equipment.
- Emergency personnel must use self-contained breathing equipment when entering areas where significant leaks have occurred. Remove leaking movable containers or cylinders outdoors into an open area with good ventilation. Record the amount of gas discharged.
- Defective cylinders must be tagged as defective and returned to the supplier as soon as possible.

J.3.2 Handling and storage

All SF6 GIS plants and storage areas must have a clearly visible safety sign at the entrance identifying the plant as an SF6 plant. Signs indicating the following must also be provided:

- Prohibiting smoking during maintenance work or emergencies
- The location of protective equipment (respiratory protection)
- Warnings that when plant fails or where maintenance work is being done on switchgear, SF6 gas and its by-products are hazardous, and that protective equipment must be used (e.g. spilling, burning through, maintenance)
- The location of an emergency shower.

- A notice stating that enclosed and lower-situated areas must be ventilated when emergencies occur.
- All safety signs must comply with the requirements of SANS 0140, Parts 1 and 2, and the colours must comply with SANS 1091.
- Sulphur hexafluoride (SF6), a high-pressure liquefiable gas, is kept in Class 3 containers as minimum (SANS 10019). Cylinders must be inspected, handled, stored, transported and used in accordance with the requirements set out in SABS 019. A register of such inspections must be kept.

J.4 Management requirements

J.4.1 Cylinder marking

SF6 cylinders are supplied to Eskom by the gas suppliers with testing markings, volume and mass capacities and serial numbers stamped on the cylinder shoulder to indicate quality testing. Identifying colours is ”Protea” pink.

J.4.2 Disposal of empty cylinders (B49 SABS 0140)

SF6 cylinders as minimum are classified as Class 3, metallic pressure receptacles of welded construction where the seams have been partially radiographed in accordance with an approved standard (SANS 10019). Only refilling with SF6 gas is allowed. The re-use of cylinders for any gas other than SF6 or any other purpose, is subject to the prior approval of the Department of Labour and compliance with the requirements of SABS 019. Cylinders should be returned to the supplier when empty or leaking. Cylinders contaminated with by-products must be decontaminated by a licensed facility before re-use.

J.4.3 Disposal of solid SF6 by-products or decomposition products

The solid SF6 by-products or decomposition products are treated with calcium chloride (CaCl2 6H2O) or sodium bicarbonate (NaHCO3) to form a non-toxic end product. Disposal of hazardous waste must be done at permitted/licensed facilities.

J.4.4 Thermal destruction

Destruction of contaminated SF6 and the decontamination of redundant SF6 cylinders may be done using thermal de-sorption. Only DEAT-approved facilities may be used for this activity.

J.5 References

a) Procedure for topping up SF6 gas filled equipment, 240-70863759-
b) Guidelines for the management of SF6 (sulphur hexafluoride) for use in electrical equipment (draft), NRS 087:2006
c) SANS 62271-4: High voltage switchgear and control gear Part 4: Handling procedures for sulphur hexafluoride (SF6) and its mixtures.

Appendix K: Waste Reporting for Eskom

K.1 Introduction

- Waste Reporting is in accordance with the requirements below:

• Divisions and all other generators of wastes will classify their wastes and rank them according to legislative requirements. This should be based at minimum on the following classification system (see table 1 and 2 below):

General Waste

Table 1 : General waste classes according to SAWIS

Waste Level				
Level 1	**Level 2**		**Level 3**	
General waste	01	Municipal waste		
	10	Commercial and industrial waste		
	20	Organic waste	20.1 20.2	Garden waste Food waste
	30	Construction and demolition waste		
	50	Paper	50.01 50.02 50.03 50.04	Newsprint and magazines Brown grades White grades Mixed grades
	51	Plastic	51.01 51.02 51.03 51.04 51.05 51.06 51.07	PETE HDPE PVC LDPE PP PS Other plastics
	52	Glass		
	53	Metals	53.01 53.02	Ferrous Non-ferrous
	54	Tyres		
	99	Other		

Hazardous Waste

Table 2 : Hazardous waste classes according to the SAWIS

Waste Level				
Level 1	**Level 2**		**Level 3**	
Hazardous waste	H01	Explosives		
	H02	Gases	H02.01 H02.02 H02.03	Flammable gases Non-flammable, non-toxic gases Toxic gases
	H03	Flammable liquids		
	H04	Flammable solids and substances	H04.01 H04.02 H04.03	Flammable solids Substances liable to spontaneous combustion Substances that, on contact with water, emit flammable gases
	H05	Oxidising substances and organic peroxides	H05.01 H05.02	Oxidizing substances Organic peroxides
	H06	Toxic and infectious substances	H06.01 H06.02	Toxic substances Infectious substances
	H07	Radioactive substances		
	H08	Corrosives		
	H09	Miscellaneous dangerous substances and goods		

K.2 Environmental impact

Incorrect and uncontrolled waste management practices lead to reputational damage for the organisation, unnecessary environmental impacts, legislative violations and health impacts to both Eskom employees and the public. Continuation of disposal of waste to landfill further defeats the ideal of sustainable development.

K.3 Management strategies

The purpose of these minimum requirements is to provide controlled methods of reporting on the waste management practices throughout the organisation. It covers Eskom's requirements for the classification, storage, handling and disposal of all hazardous and general wastes. Assessing and trending the amount of waste produced and sent to landfill is pivotal in starting to understanding the environmental footprint of the organisation. Accurate and frequent reporting by each activity in the organisation is thus required to ensure that a proper account is made of the quantities of wastes, the types of wastes and the processes from which waste is produced. This will allow opportunities for continual improvement to the waste management systems to ensure that sustainable processes for meeting the South African hierarchy of waste requirements are implemented.

All waste reporting must be done in accordance with the Eskom Waste-reporting Requirements (template 240-47176064).

K.4 Management requirements

K.4.1 Priority waste reporting

- Priority wastes and waste management activities will be reported on within the organisation on a six monthly and annual frequency as listed below:
- Priority wastes identified for reporting include; ash produced, disposed and recycled, radioactive waste, PCB, and asbestos waste generated and disposed.
- Progress on the development and implementation of the Divisional waste management plan (WMP);
- Updating of PCBs inventories and phase out plan and progress in completing the phase-out plan;
- Information on Eskom owned waste sites including all waste disposed of at Eskom waste disposal facilities;
- Information on waste stored at waste transfer facilities, including Eskom owned facilities.

K.4.2 Reporting of other wastes

a) Reporting of the following wastes and waste activities will also take place. The report will include information on:
   - General waste that was generated and disposed
   - Hazardous waste (not on the priority list) that was generated, stored, or disposed
   - Waste that was re-used or recycled
   - New waste streams generated within the business

b) Reporting frequency
   - Waste reports are required by the Sustainability Report on a six-monthly and annual basis, but the divisions are encouraged to maintain their records on a monthly basis.

c) Reporting format

The template for Eskom Waste reporting (240-47176064) must be used and as a minimum have the following information as sign off:

- Date of submission
- Reporting period - period to which report applies
- Business Area covered by report, including any exclusion
- Name of person submitting report
- Name of responsible manager (i.e. power station manager, Regional Engineering Manager, Grid manager)

d) Waste densities for conversions are tabled in table 3 below.

K.4.3 Reporting on SAWIS

- Business Units are required to register on the South African Waste Information System (SAWIS) in accordance with the National Waste Information Regulations, GN R. 625, if they meet the following criteria:
  - Disposal of general waste to land covering an area in excess of 200m2.
  - Disposal of any quantity of hazardous waste to land.
  - Generators of hazardous waste in excess of 20kg per day.
  - Recovery or recycling of waste
  - Treatment of waste
- Registration of waste management activities allows DEAT to issue a unique identification number, to be used when providing data to the SAWIS.
- Registration of Business Units and reporting on South African Waste Information System will be done by the Waste Centre of Excellence, on behalf of Eskom

Table 3: Waste Categorization and Densities according to the SAWIS

Waste categorisation	Waste type	Density (kg/m^3)
Domestic waste	Domestic waste compacted in REL	500
	Domestic waste uncompacted	200
	Mix domestic/garden (more domestic than garden)	200
	Mix domestic/building rubble (more domestic than building)	250
Commercial/Industrial	Commercial/Industrial - packaging (paper & plastics)	200
	Commercial/Industrial - timber/metal	150
	Tyres	150
Inert Waste (Construction waste)	Building rubble/concrete/sand/fibreglass/bricks/ceramics	750
	Building rubble/industrial mix (more building than packaging)	350
	Building/garden mix (more building than garden)	250
Garden waste	Loose grass/small branches	200
	Large logs	400
	Garden/building mix (more garden than building)	250
Perishable waste	Food waste/animal fodder	840

K.4.4 Asbestos containing waste and ash calculations.

Calculations of ash produced

The following conversions and calculations for asbestos containing waste and ash are used when reporting waste.

1. Asbestos containing waste

1.1 To convert volume to mass, the following calculation must be used.

Mass = Density x volume
= kg.m-3 x m3
= kg

1.2 To convert 210 l drums to mass, the following calculation must be used.

1m3 = 1000 l
X = 210 l drum
X = 210 l x 1 m3/1000 l
= 210 m3/1000l
= 0.21 m3

From here, one must follow the calculation 1.1 above.

NB: Density for asbestos containing waste is 400 kg/m3.

K.4.5 Ash produced

The total ash produce d is calculated based on the ash content % and the coal burnt tonnage.

Mass of ash produced = Total coal burnt multiply by % ash content

K.4.6 Ash disposed

The ash disposed is calculated based on the following calculation.

Ash Disposed = Ash Produced - Ash Recycled - Ash Emitted

Appendix L: Solvents

L.1 Introduction

Solvents and cleaners are widely used in Eskom for the removal of waxes, greases, oils, carbon and various other contaminants from equipment during routine maintenance and general cleaning. Increasing environmental and worker safety concerns as well as tightening government regulations resulting in the stricter control of these solvents and cleaners, many of which are classified as toxic.

L.2 Environmental impacts

The purpose of this procedure is to prescribe methods for managing solvents throughout the organisation. It covers Eskom's requirements for the storage, handling, disposal and reporting of all solvents. Solvents can be regarded as hazardous due to their potential environmental impacts, including air pollution, water and soil contamination, harm to wildlife, fire hazard and health hazards, among others poisoning, damage to the human body and disorders.

L.3 Management strategies

Storage of solvents must be in accordance with the specific minimum requirements of the Materials Safety Data Sheet (MSDS). To ensure the safe storage of chemicals, the store must be designed to cater for possible spills, fire and other mishaps, and must conform to the minimum requirements specified in SANS 10108.

L.4 Management requirements

L.4.1 Storage

- Determine the flash points and volatility of solvents, and ensure that the storage facility caters for these factors.
- Use the appropriate personal protective equipment as recommended on the MSDS or the container label.
- Store all solvents in temperature-controlled environments, or as specified on the MSDS, and away from direct sunlight.
- Store flammable solvents, if possible, where special ventilation and electrical systems minimise the possibility of accidental fire or explosion.
- Store flammable solvents in tightly closed safety containers.
- Dispense solvents, from safety-approved nozzles and dispensers only, into clearly marked containers.
- Store solvents away from oxidisers.
- Check storage containers regularly to make sure that the spout, cap and container are in good working order and not leaking.
- Immediately replace damaged container parts such as flame arrester screens.
- Smoking and eating in solvent storage areas or around dispensing containers are prohibited
- The location of spill control stations and materials, eyewash stations and safety showers, must be clearly indicated/demarcated.

- Usage
- The prescribed PPE and other protection measures must be used when working with solvents, unless otherwise stated in the Occupational Health and Safety Risk Assessment.
- All solvents must be used in conjunction with safe working procedures.
- All lighters, matches or sparking devices are to be removed before a worker handle solvents.

L.4.2 Disposal

- Every solvent manufacturer has its own disposal procedures, and these must be reflected on the MSDS.
- Additional requirements:
- Solvent waste must be removed from the work area and disposed of only at permitted/licensed waste disposal sites and by using appropriate removal contractors, in accordance with the relevant regulations.
- Final disposal of solvent waste, including the mode of transport, must be in accordance with the relevant legislation and is subject to approval by the applicable business unit.
- Records must be kept of the quantities disposed of.
- Flammable solvents must be disposed of in approved containers, never directly into sewers, storm water drains, garbage dumps or onto the ground.
- Smoking and eating are prohibited around solvent containers and disposal sites.

L.4.3 Training

- Ensure that all users of solvents are informed or trained in the purchase, storage, usage and disposal of solvents.
- Employees must be informed about the contents of an MSDS

L.5 References

a) OHSAct, Act of 85 of 1993
b) Regulations for Hazardous Chemical Substances, GN R1179 of 25 August 1995 as amended in 25 June 2003
c) SANS 10108: The classification of hazardous locations and the selection of apparatus for use in such locations.

Appendix M: Ozone-Depleting Substances

M.1 Introduction

Ozone-depleting substances (ODSs) are compounds that contribute to the depletion of stratospheric ozone. These ODSs are generally very stable in the troposphere and degrade under ultraviolet light in the stratosphere, releasing chlorine or bromine atoms, which deplete ozone.

The following controlled substances are most frequently utilised commercially:

- CFC11- Air-conditioning, insulation materials, aerosols, solvents
- CFC12- Refrigeration, air-conditioning, insulation materials, aerosols
- CFC113 – Insulation materials, aerosols, solvents, air-conditioning
- CFC114 – Insulation materials, aerosols
- CFC115 – Refrigeration
- BCF (Halon 1301) – Fire-fighting, fixed installations
- BTM (Halon 1211) – Fire-fighting, fire extinguishers
- Carbon tetrachloride – solvents, pharmaceuticals, feed stock
- 1,1,1 Trichloroethane – Insulation materials, solvents, adhesives
- HCFCs (40 substances) – Refrigeration, air-conditioning, insulation materials, solvents aerosols
- Methyl bromide – pesticides.

The Montreal Protocol on Substances that Deplete Ozone Layer controls the phasing out of 96 substances grouped into 4 annexes (A, B, C and E) according to their ozone-depleting potential and phase-out dates. The controlled substances are from the following groups of chemicals:

- Chlorofluorocarbons(CFCs)
- Bromofluorocarbons(BCF)
- Bromochlorofluorocarbons
- Hydrochlorofluorocarbons(HCFCs)
- Methyl bromide
- Carbon tetrachloride
- Trichloroethane

It is expected that Eskom Holdings Limited has phased out ozone-depleting substances (ODSs) according to South Africa's national commitment to the Montreal Protocol and its amendments. Due to a change in staff and procurement processes this appendix will however, be left in for one more review cycle to ensure that these requirements are entrenched within the procurement processes and that no further purchasing of ODSs occurs.

M.2 Environmental impacts

The purpose of this procedure is to provide controlled methods of managing ozone-depleting substances throughout the organisation. It covers Eskom's requirements for the storage, handling and disposal of all ozone-depleting substances.

M.3 Management strategies

Eskom must phase out ozone-depleting substances (ODSs) in accordance with the national commitment for the implementation of the target dates stipulated in the Montreal Protocol (1987) and subsequent amendments.

The Montreal Protocol came into force in 1987. The South African government signed the 1990 London amendment to the Montreal Protocol as a developed country. The country was reclassified, on application, as a developing country in 1997.

M.3.1 The reclassification means that:

- South Africa no longer needs to contribute annually towards the Multilateral Fund which helps developing countries manage their implementation programmes of the Protocol.

- For any phase-out schedule of newly controlled ODSs not yet controlled under the Protocol, South Africa was afforded the 10-year grace period (from 1997) like any other developing country. This includes the phasing out of HCFCs and methyl bromide.

M.3.2 Re-classification restrictions:

- South Africa has to undertake to honour all obligations undertaken while still classified as a developed country.

- South Africa cannot ask for financial assistance from the Multilateral Fund of the Montreal Protocol.

M.4 Management requirements

M.4.1 Phase-out dates for controlled ozone depleting substances in South Africa

The following phase-out schedule has been accepted:

Annexe/group	Substances	Phase-out dates in South Africa
annex C Group 1	HCFC	By 1 January 2040 consumption will be restricted to zero

M.4.2 Eskom ODS management and phase-out strategy

- An inventory (GN 33925) of ODS types, their location and application as well as quantities in storage and use must be maintained, audited and reported annually. This must be reflected through business division performance indicators.
- All precautionary measures practicable must be undertaken to prevent and minimise leakage of controlled substances.
- A phase-out plan, programme and budget must be developed and approved by the relevant Divisional Executives.
- Suitable storage facilities must be provided for the transition phase-out programme.
- Contaminated fluids must be stored separately from new fluids for controlled destruction or reclamation.
- No purchases of the new ODS fluids (controlled under annex A, B and C Groups 2 and 3) of the Protocol may be permitted.
- No trading with ODSs may be allowed. Ownership of ODSs must only be transferred from Eskom to the registered ODS bank holder.
- Awareness and technology training programmes on the handling of controlled fluids must be implemented.
- Purchases of new equipment, materials or processes which utilise ODSs during manufacture or operation may not be permitted where suitable alternatives exist.
- Portable fire extinguishers containing halon must be replaced and the content disposed of through the Halon Bank of SA.
- Conservation of the CFC and HCFC refrigerants, i.e. recovery and recycling, and leak protection of the equipment and storage facilities must be standard practice.
- Adhere to the reporting requirement in legislation where the owner of fixed equipment must within 14 days of being informed about a leakage report to the DG according to section 4 of GN 33925.

Reporting on ODSs must be in line with Appendix K: Waste-reporting Requirements as contained in this standard.

M.4.3 Accountability and responsibility

Divisions and subsidiaries of Eskom Holdings will be accountable for the implementation of plans and programmes to comply with this standard as required and to provide appropriate reports.

M.4 References

a) TSI 02 MECH024 Status report on the management of the Phase Out ozone depleting substances in Esk.PDF

b) Ozone depletion and its effects - http://www.environment.gov.za/Documents/Documents/2003May29/ozone_depletion_29052003.html

c) PHASING OUT OF OZONE DEPLETING SUBSTANCES (ODs) - REPORT No TSI/OI/MECH071

d) Proposed regulations regarding the Phasing out and management of ODS in the republic of South Africa –Notice 12 of 2011, GN No: 33925.

Appendix N: Silica Gel Management

N.1 Introduction

Silica gel is used to dry the air as it flows through a bed of silica gel beads in a breather connected to the transformer. The insulating oil of the transformer heats up during operation and it expands into the conservator tank and subsequently pushes the dry air out of the conservator tank through the breather which is filled with silica gel. When the oil cools down, it retracts and sucks fresh air from the atmosphere through the breather and from this point, the silica gel acts as a dryer for the air that goes back into the conservator tank. Dehydrated silica gel is colourless. When a visible indication of the moisture content of the silica gel is required cobalt chloride is most commonly, is added. This will cause the gel to be blue when dry and pink when hydrated.

According to the European Commission Directive 98/98/EC (amendment to 67/548/EEC), cobalt chloride has been reclassified as a carcinogen by inhalation. This change is also reflected in South African legislation, where cobalt chloride is now classified as a Hazard Group 2 Carcinogen. Due to the widespread use of cobalt chloride as a moisture indicator in silica gel desiccant, used in transformer breathers, the concern is that this might impact on the health of workers, ground and surface water quality as well as more economically based concerns, such as the use, packaging and disposal of the gel.

N.2 Environmental impacts

Silica gel is non-toxic, non-flammable, and non-reactive and stable with ordinary usage, but will react with halogens, strong acids, strong bases, and oxidizers. The storage requirements on the MSDS must therefore be strictly adhered to.

The silica gel containing either blue cobalt chloride or copper chloride have some noxious consequences on lungs but generally does not cause illness or toxic effect if exposure is limited to occupational level, but exposure may aggravate pre-existing diseases such as asthma and bronchitis. Crystalline silica dust can cause silicosis. Staff working with silica gel therefore must have this task highlighted in their Man Job specifications.

When disposed to land or water, the used silica gel containing copper chloride, is toxic to aquatic life.

N.3 Management strategies

To preserve the integrity of the silica gels used, the following strategies shall be followed:

- Only silica gel approved by Eskom shall be used.
- Recycling of silica gel is not recommended due to the risk of reducing its effectiveness.
- Silica gel should not be reconditioned.
- Used silica gel shall be disposed at a hazardous waste site.

N.4 Management requirements

N.4.1 Handling

- In order to eliminate the safety and environmental risks when any silica gel is handled, the following precautions must be applied:
- Personal protective equipment must be worn when handling the silica gel
  - Use gloves to prevent skin contact
  - Use safety glasses for eye protection
  - Use an approved dust respirator for respiratory protection, since dust from the gel may be harmful to the lungs
- Sieve the silica gel to remove any “powder” that could clog the breather or impair free airflow
- Silica gel contaminated with oil shall be disposed of as it will no longer adsorb moisture. Discoloured gel (brown, grey, black, etc.) indicates contamination and shall be disposed
- The used silica gel shall be held in a suitable container labelled as Used silica gel until a sufficient quantity has accumulated to be collected by an approved hazardous disposal contractor.
- Incorrect disposal, spillage on land and in pathways of surface water runoff, or the misuse of the waste material is prohibited and shall be reported as a spill incident under 32-95 and 32-245, should accidental spillage of the silica gel occur.

N.4.2 Disposal considerations

- Used silica gel should be managed in an appropriate manner and disposed at approved hazardous waste disposal facilities.
- Disposal of used containers, including molecular sieves and desiccants, must be done in accordance with legislative requirements for hazardous waste.
- Processing, use or contamination of this product may change the recommended waste management options; the generator of the waste must ensure that the contaminated waste is reclassified before disposal to determine the correct waste management and disposal options for the contaminated waste.
- If large quantities of used silica gel is generated or no need to accumulate before disposal, use plastic collection containers to store the used material in until it is collected. The large original silica gel containers could be used for storage of such material.
- When using these or any other large containers for storage, please adhere to the following procedure:
  - the waste is stored in such a manner that no pollution of the environment occurs at any time;
  - the date upon which accumulation begins is clearly marked and visible for inspection on each container;
  - while being stored on site, each container and tank is labelled or marked clearly with the words “Hazardous Waste”;

- the Generator fences off the storage area to prevent unauthorised access and erects a weather-proof, durable and clearly legible notice-board in official languages at every entrance of the storage area with the words “Hazardous Waste: unauthorised entry prohibited”
- Label the drum with yellow hazardous waste sticker as soon as you begin using it.
- Do not fill the drum more than 3/4 of the drum’s capacity.
- Dispose the 3/4 full drum with the regular hazardous waste pickup.

N.5 References

a) Environmental Health and Safety (2007-09-10). ""Silica Gel"". http://www.jtbaker.com/msds/englishhtml/S1610.htm. Retrieved on 2008-01-12.

b) Fisher Scientific (1997-02-09). ""Silica Gel Desiccant"". http://www.atmos.umd.edu/~russ/MSDS/silicagel28200.html. Retrieved on 2008-01-12.

c) **Standard for the use and maintenance of silica gel breathers for power transformers TST41-82**

d) SILICA GEL, MOLECULAR SIEVES AND DESSICANT DISPOSAL [From: http://web.princeton.edu/sites/ehs/chemwaste/silicagel.html](6 Aug 09)

e) From Wikipedia, [http://en.wikipedia.org/wiki/Silica_gel] (6 Aug 2009)

The Silica gel used for breathers 2011 Eskom flyer. This flyer was sponsored by Eskom research Compiled for EIOSC(Eskom Insulating oil steering committee): Annalie Lombard (+2711) 629-5360 E-mail: annalie.lombard@eskom.co.za

Appendix O: Recycling of Waste

O.1 Introduction

The first National Waste Summit was hosted by the then Department of Environmental Affairs and Tourism (DEAT) in September 2001. The Summit was held in recognition that waste management should be a priority for all South Africans and that there is an urgent need to reduce, reuse and recycle waste in order to protect the environment. The vision of the Summit was to implement a waste management system which contributes to sustainable development and a measurable improvement in the quality of life, by harnessing the energy and commitment of all South Africans for the effective reduction of waste. The outcome of the Summit was the Polokwane Declaration on Waste Management. To meet this objective, South Africans need to reduce waste generation and disposal by 50% and 25% respectively by 2012 and develop a plan for zero waste by 2022. Since this declaration, the National Environmental Management Waste Act, 2008, (Act 59 of 2008) was developed and enacted in March 2009, followed by the National Waste Management Strategy (2011) and a number of regulations published in support of the aims of the Act.

The Waste Act is structured around the waste management hierarchy. The hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority, namely waste avoidance and reduction, re-use and recycling, recovery and treatment, with disposal as the last resort (Figure 1).

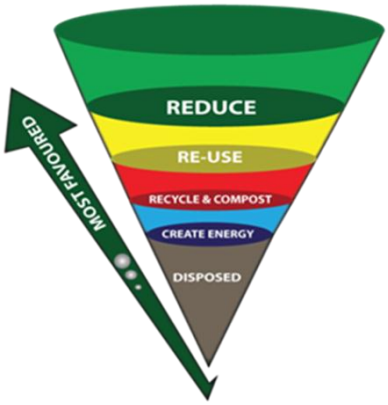

Figure 1: Waste management hierarchy

The National Waste Management Strategy (NWMS) (Notice 344 of 2012), aims to address the numerous challenges facing waste management in South Africa. The strategy is structured around a framework of 8 specific goals that are to be achieved by 2016. The first of these goals is to promote waste minimisation, re-use, recycling and recovery of waste, with the following targets:

- 25% of recyclables diverted from landfill sites for re-use, recycling or recovery.
- All metropolitan municipalities, secondary cities and large towns have initiated separation at source programmes.
- Achievement of waste reduction and recycling targets set in Industry Waste Management Plans for paper and packaging, pesticides, lighting (CFLs) and tyres industries.

- The objective of this section is to develop a realistic and practical approach towards a culture of recycling, and compliance with prospective legislation.

O.2 What is recycling?

Recycling of waste refers to the separation at source of recyclable materials from the general waste stream and the reuse of these materials. It is an important part of the waste management hierarchy. The objectives of recycling are to save resources as well as reduce the environmental impact of waste by reducing the amount of waste disposed at landfills. To meet these objectives, waste separation at source is proposed, as the quality of recyclable materials is higher when separated at source. In addition, recycling has the potential for job creation and is a viable alternative to informal salvaging at landfills, which is undesirable due to the problems of health and safety.

The most recent National Waste Information Baseline Report indicates that South Africa generated approximately 108 million tonnes of waste in 2011 where 98 million tonnes were disposed of at landfills. Only 10% of all waste generated was recycled during that year and only 27% of urban households reported some recycling behavior. The most waste streams that South Africans recycle are the steel beverage cans (69%), paper (59%), glass (25%) and plastic (17%).

Recycling should be promoted and supported in order for it to reach its full potential and to maximise formal and informal employment opportunities.

O.3 Benefits of recycling

Recycling of waste has the following benefits:

- It reduces the waste stream going to landfill sites, thus saving landfill airspace
- Opportunities for income generation and alleviation of poverty through job creation
- It helps reduce pollution and conserve natural resources
- It conserves energy and reduces manufacturing costs
- It can reduce informal salvaging from landfill sites
- Contributes to a cleaner, greener and healthier South Africa
- Pride in our environment
- Reduced costs to local authorities
- Eskom sites are encouraged to recycle waste.

O.4 What can be recycled

- The recycling of waste in Eskom is not only limited to the following waste streams. Eskom sites must investigate opportunities to recycle other wastes that they are generating.
- Coal combustion products (ash and gypsum), metals and oil mentioned above can also be recycled.

O.4.1 Tins (Cans)

Cold drink and beers cans, food tins, aluminium foil, paint tins and aerosol cans can all be recycled. In fact, just about any old metal can. But in your day-to-day household or office waste you'll probably find that you're most likely going to recycle steel food and beverage cans.

Cans are 100 percent recyclable. They are melted down to make new steel. This reduces the need to mine new iron ore and saves on the energy used to mine and process it. More than 36 000 tons of steel is annually recovered by recycling, subsequently taking pressure of the mining sector. The new steel primarily comes from cans. Recycling of one aluminium can saves enough energy to run a TV for three hours and for every one ton of aluminium can recycled, 6295 litres of oil is saved and 14.5265 cubic meters of landfill space is saved (which is equivalent to the size of a minibus taxi).

O.4.2 Glass

Glass is made from sand, lime and soda, and is completely recyclable but it does not biodegrade. According The Glass Recycling Company, in South Africa only 25% of all non-returnable glass containers produced annually are retrieved for recycling, the rest, about 550 000 tonnes, end up in our landfill sites. Glass containers such as tomato sauce, jam and mayonnaise bottles, juice bottles and wine bottles, no matter what the colour, can be recycled.

O.4.3. Paper

Paper is a renewable resource (because it's made from trees) and most paper can be recycled (thus less trees need to be chopped down and less land and water is needed to grow them). There are different grades of paper that you can collect for recycling, such as: high-grade white office paper, Kraft paper, corrugated board, cardboard boxes for packing and food, magazines, newspapers, scrap paper such as junk mail, envelopes, wine bottle sleeves, pamphlets and telephone directories.

Every tonne of paper recycled saves 17 trees uses 40 percent less energy, and 50 percent less water.

The energy saved from paper recycling in a year is said to be enough to provide electricity to 512 homes for a year.

If all our newspaper was recycled, we could save about 250,000,000 trees each year!

A tonne of recycled paper can save up to three cubic metres of landfill space and subsequently reduce transport costs for local municipalities.

For every ton of cardboard that is recycled it helps save about 174.12 litres of oil.

Divisions can also make an effort to reduce the amount of paper produced, promote energy efficiency and cost savings at work, by following these tips:

- print double sided.
- make black and white your default option
- use shared printers, preferably multifunction
- Preventing lost printing by using a password
- Re-use of paper,

- Use smaller fonts,
- Choosing email vs. print,

O.4.4 Plastics

Plastics are made from oil, a non-renewable resource, and much of the plastic packaging we use every day is recyclable. Ice cream and milk containers, fabric softener bottles, plastic bags and even cling-wrap can all be recycled.

The easiest way to determine whether a plastic product is recyclable is by looking for its recycling logo. There are seven plastic recycling logos and most plastic packaging is imprinted with one of them. The logos tell you what type of plastic a container is made of. Each type has to be recycled separately. (Plastic recycling logos)

Recycling a ton of PET containers (plastic) saves 7.4 cubic metres of landfill space.

O.4.5 Tetrapak

Fruit juice and milk containers look like they're made out of paper, but they are lined with aluminium foil and plastic so they must be recycled separately. Tetra Pak can be recycled into roof tiles, furniture and stationery.

O.4.6 Electronic waste (e-waste)

E-waste is the term used to describe discarded appliances that use electricity. It includes computers, cellphones, iPods, iPads and other tablets, gaming consoles, fridges and other household appliances, batteries and fluorescent lightbulbs. E-waste contains valuable materials – such as gold, silver, copper and platinum – and harmful materials, such as lead, arsenic, mercury and brominated flame retardant (BFR) plastics, which require special handling and recycling methods.

The recycling processes and disposal of these components, while being a lucrative business proposition for some, pose serious health risks and environmental dangers. The formation or discharge of hazardous emissions during the recycling of electrical and electronic equipment depends heavily on the handling of electronic waste. Hence hazardous substances contained in computers and televisions do not automatically pose a risk to the environment and human health. Some recycling processes applied in transition and developing countries can cause serious health problems and contaminate air, water and soil.

In South Africa any electronic and electrical waste that is recycled is firstly dismantled and manually sorted into its various fractions, which include printed circuit boards (PCBs), cathode ray tubes (CRTs), cables, plastic components, precious metals, strategic metals and base metals (ferrous and non-ferrous), condensers and other (nowadays) invaluable materials such as batteries, LCDs and even wood.

The valuable fractions are processed further by the large recyclers during refining and conditioning processes. The different e-waste fractions are processed into directly reusable components and into secondary raw materials during a variety of refining and conditioning processes.

Electronic waste can be disposed of as solid waste after having completed its life cycle but otherwise should be refurbished or reused or recycled (remanufactured, restored, renovated, repaired, or recharged). Hazardous materials should be disposed as per national requirement.

O.4.7 Cartridge recycling

The ink in the cartridge has certain health effects. The potential routes of over-exposure are the skin and the eyes. Inhalation of vapour and ingestion are not considered to be significant routes of exposure under normal use conditions. Ingestion of the ink will pose acute health hazards. It may cause kidney and liver damage and could depress the central nervous system.

Some kinds of toner dust contain hazardous materials. Inkjet inks can also contain a range of chemicals that are harmful to the environment. These materials pose no threat while they are contained within the cartridge. However, these pollutants can escape when cartridges are pulled apart during poorly managed refilling or recycling operations or when dumped cartridges start to deteriorate in landfill. Toner dust is also extremely fine (5 – 15 microns), so it can easily leach from landfills into nearby waterways, ground water and ultimately the oceans.

Divisions are encouraged to do the following:

1. Initiate contracts for printer cartridge recycling

2. Monitor the progress of recycling

A cartridge can be disposed of as solid waste after having completed its life cycle as a consumer item, but otherwise should be refurbished for reuse (remanufactured, restored, renovated, repaired, or re-charged). Refurbishing a cartridge is defined as disassembling the cartridge, cleaning it, changing parts if needed, and refilling it with toner.

O.4.8 Batteries

Every day thousands of batteries are produced to service everything from industrial machines, automobiles and even golf carts. Anything that needs mobile electricity needs a powerful battery. The problem is that defunct batteries pose an environmental problem. If not dealt with correctly the hazardous materials such as lead, acid and plastic end up being cast away and negatively impact the environment.

O.4.8.1 Impacts of batteries

- Heavy metal contamination due to leachate form landfills
- Exposure of the environment to lead and acid
- Vaporization of metals upon incineration of the battery
- Irritation to the skin and eyes as batteries contain acid
- Electrification hazard due to shorting of exposed terminals
- Accidental ingestion (especially by children/toddlers)

Thus, due to issues pertaining to government legislation, social responsibility, environmental concern and economic benefits, it is important to gain a proper understating of how to dispose of batteries. Recycling is always the best option for disposing of used batteries.

Table 1: Summary of proper disposal methods for various battery types

Battery Type	Examples of Use	Classification	Disposal method
Alkaline, Carbon Zinc, Nickle Metal Hydride (in various sizes e.g. AAA, AA, 6V, 9V).	Flashlights, torches, toys, clocks, smoke alarms, remote controls	Non-hazardous	Dispose of them in containers for batteries provided at selected supermarkets.
Nickel-Cadmium (Rechargeable) AAA, AA, C, D, 6V, 9V	Flashlights, toys, cellular phones, power tools, computer packs	Hazardous	Dispose of them in containers for batteries provided at selected supermarkets or dispose of them at a hazardous waste site.
Silver oxide, Mercuric oxide, batteries or button cell batteries	Watches, calculators, hearing aids, toys, greeting cards, remote controls	Hazardous	These contain mercury, which is a toxic substance. Dispose of them in containers for batteries provided at selected supermarkets or dispose of them at a hazardous waste site.
Lithium / Lithium Ion (3V, 6V, 3V button)	Cellphones, laptop computers, Cameras, calculators,	Non-hazardous	Dispose of them in containers for batteries provided at selected supermarkets.
Lead Acid Vehicle, Sealed Lead Acid	Car, trucks, motorcycles, power tools; metal detectors, Video cameras, wheelchairs clocks,	Hazardous	These are very harmful in landfill because they contain lead and sulphuric acid. But they can be recycled. Return to place of purchase or find a centre that will take them.

O.5 References

a) Department of Environmental Affairs (2012). National Waste Information Baseline Report. Department of Environmental Affairs. Pretoria, South Africa.

b) Grant, L., 2011: Treevolution The Beginners Guild To Recycling. Accessed 2015-06-26 http://treevolution.co.za/guide/
c) http://www.nwmsi.co.za
d) http://www.environment.gov.za/ProjProg/WasteMgmt/Polokwane_declare.htm
e) The National Waste Management Strategy (NWMS), 2011
f) http://www.ehso.com

Appendix P: Waste Classification and Management

P.1 Introduction

Waste Classification and Management Regulations, GN R. 634 came into operation on the 23 August 2014. The purpose of the regulations is to regulate the classification and management of waste in a manner which supports and implements the provisions of the Act; establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence; prescribe requirements for the assessment of the environmental risk associated with disposal of waste to landfill; prescribe requirements and timeframes for the management of waste; and prescribe general duties of waste generators, transporters and managers.

P.2 Waste classification

- The Regulations require that waste be classified in accordance to SANS 10234 (GHS) within 180 days of generation. Not all waste will be classified. Waste listed in Annex 1 of these Regulations does not require classification.
- Divisions must familiarise themselves with Annex 1 of these regulations and check which waste they generate needs to be classified.
- BU's must ensure that mixtures of waste does not happen prior classification, if classification will be performed
- Waste must be re-classified every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors.
- If waste was subjected to any form of treatment, it must be classified

P.3 Safety Data Sheet (SDS)

- Divisions must ensure that the SDS's for waste classified are prepared in accordance with SANS 10234
- Divisions do not have to prepare the SDS's for pre-classified hazardous waste provided they reflect the product the waste originates from and for mixed waste, the details of the specific hazardous waste/s or hazardous chemical/s in the waste.
- SDS's are not required for medical waste and general waste unless it (general waste) was contaminated with hazardous waste
- All the Divisions generating hazardous waste, except health care risk waste (medical waste), must be in possession of the SDS's.

P.4 General waste management

- Waste transporters and waste managers are not allowed to accept waste that has not been classified or pre-classified. Divisions must take note of this.

- Any waste container or storage impoundment holding waste must be labelled, or where labelling is not possible, records must be kept, reflecting the following:

a) the date on which waste was first placed in the container;

b) the date on which waste was placed in the container for the last time when the container was filled, closed, sealed or covered;

c) the dates when, and quantities of, waste added and waste removed from containers or storage impoundments;

d) the specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations, 2012 (see table 3 above); and

e) the classification of the waste in accordance to SANS 10234 once it has been completed.

- Division are not allowed store waste for more than eighteen (18) months of generation without it being re-used, recycled, recovered, treated and/or disposed of.
- Eskom sites that have waste disposal sites are not allowed to store waste for more than eighteen (18) months from the date of receipt from the waste generator.
- Waste must not be mixed or treated where this would reduce the potential for re-use, recycling or recovery or result in treatment that is not controlled and not permanent.
- Waste may be blended or pre-treated to improve the potential for re-use, recycling, recovery or treatment or reduce the risk associated with the management of waste

P.5 Record keeping and waste manifest

- Divisions are required to keep accurate and up to date records of waste generated
- The records must reflect the following:
  - classification of waste;
  - quantities of waste generated expressed in tons or m3 per month;
  - quantities re-used, recycled, recovered, treated and/or disposed of and
  - by whom each waste was managed
- The records must be retained for a period of at least five (5) years and made available to the Department upon request.
- Divisions or BU's having hazardous waste, whether classified in terms of SANS 10234 or pre-classified, must be in a possession of the waste manifest documents.
- Generators of waste classified as hazardous, must complete a waste manifest document for each consignment of waste transported to a waste manager. The waste transporters and managers must also complete their waste manifest documents. The waste manifests documents must be completed with the information specified in these regulations.
- The BU's generating hazardous waste and dispose it on their own waste disposal facilities, do not have to complete the waste manifest documents.
- Waste transporters and managers are not allowed to accept waste classified as hazardous for transport, unless the waste manifest document accompanies the waste.

P.6 Implementation and transitional provisions

- If the Divisions/BU's have classified waste in terms of Min requirements, or waste for which an alternative classification was approved by the DWA or DEA, prior to these Regulations taking effect, they must be reclassified using SANS 10234 and assessed if the waste is to be disposed to landfill within 3 yrs
- Waste not classified at all must be classified using SANS 10234 and assessed within 18 months.

Appendix Q: Contaminated Land Provisions

Q.1 Introduction

The contaminated land provisions in Part 8 of Chapter 4 of the National Environmental Management: Waste Act of 2008 (NEM:WA) (Act 59 of 2008) came into operation on 02 May 2014.

The provisions have significant ramifications in that they apply to the contamination of land even if the contamination -

a) occurred before the commencement of NEM:WA;

b) originated on other land;

c) arises or is likely to arise at a different time from the actual activity that caused the contamination; or

d) arises through an act or activity of a person that results in a change to pre-existing contamination.

Q.2 Definition of contaminated

According to NEMWA, ‘‘contaminated’’ means the presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely.

The land contamination provisions provide for ‘high risk activities’ which are activities of an organisation which could potentially lead to land contamination. If Eskom has a site where high risk activities have been taken or are taking place, the site is likely to have contamination. High risk activities include processes involving substances that present a likelihood of harm to health or the environment. For Eskom, these include waste disposal sites, oil storage sites, temporary hazardous waste storage facilities, underground fuel storage facilities, ash dams/dumps, coal stock yards and HV yards. Historical incidents at Transmission substations, Distribution depots or Generation sites could be indicators of contaminated land, eg oil spills from major transformer failure.

The Norms and Standards for contaminated land stipulate a list of contaminants that need to be checked in order to confirm if land is contaminated. The contaminants include amongst others: Chromium III and IV, Lead, hydrocarbons and sulphates. If the Soil Screening Value of a particular contaminate exceeds the value stipulated in the norms and standards, it means that the land is contaminated. The soil screening values indicate the levels according to which contaminated land must be remediated to.

Q.3 Identification and notification of investigation areas

The contaminated land provisions have a notification duty. They require a land owner who suspects that they own land which is significantly contaminated (with respect to different receptors and land use scenarios) or a person who undertakes an activity that caused the land to be significantly contaminated, to notify the Minister and MEC of the contamination as soon as that person becomes aware of that contamination. Failure to comply will result in a specific offence in terms of NEMWA and a person convicted is liable for a fine not exceeding R10 million or to imprisonment for no more than 10 years or to both such fine and imprisonment, plus any other penalty or award under the National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998).

The Minister may issue a written notice to a particular person identifying specific land as an investigation area if he/she on reasonable grounds believes that the land is or is likely to be contaminated. An investigation area is a land that is believed to be contaminated or land on which high risk activities have been taken or are taking place that are likely to result in land contamination. Once the Minister/MEC has identified such areas, or the owner of land or the person who undertook the activity has notified the Minister and MEC of significant contamination, a site assessment may be required and must be submitted to the Minister or MEC. The findings of the site assessment report will determine whether the investigation area is contaminated or not. The investigation area may be regarded as contaminated even if the findings of a site assessment report do not indicate potential harm to the environment The legislation does not distinguish between sites which have been decommissioned or sites which are still operational.

Should a site assessment be required, such as assessment must be conducted as per the requirements of the Norms and Standards for the remediation of contaminated land. These provide for a uniform national approach to determine the contamination status of an investigation area; limiting uncertainties about the most appropriate criteria; provides for a method to apply in the assessment of contaminated land and provides minimum standards for assessing necessary environmental protection measures for remediation activities.

Q.4 Consideration of site assessment reports

Upon receipt of a site assessment report, the Minister or MEC may decide whether an investigation area is contaminated or not, whether remediation is required or not, or whether the risk must be monitored and managed. In cases where the site must be remediated, the landowner or person must appoint an independent person to compile a remediation plan which provides remediation objectives and future land use. Furthermore, the Minister or MEC may declare a contaminated area as a remediation site and issue a remediation order. A remediation order may impose limitations on the use of the land and provisions may therefore significantly impact the value of land and future land use planning. Should the investigation area not present an immediate risk, measures must be taken to address the monitoring and management of that risk.

Q.5 Orders to remediate contaminated land

The remediation order will provide details of the remediation site and conditions that must be complied with during remediation of the site. The Minister or MEC may instruct officials within his or her Department to ensure compliance with the remediation order. Non-compliance with the remediation order is an offence. There are no timeframes stipulated in the legislation regarding the remediation plan. It must be done based on the risks imposed and the budget.

Q.6 Transfer of remediation sites

The Contaminated Land Provisions have an effect on the alienation of land as no person may transfer contaminated land without informing the person to whom that land is to be transferred that the land is contaminated. In case the site is in the process of remediation, the Minister or MEC must be notified and conditions that are specified by them must be complied with before such transfer takes place. Liability can be traced back. The Minister must notify the Registrar of Deeds of any land declared as contaminated.

Q.7 Contaminated land register

The Minister will keep a National Contaminated Land Register. The register will include details of the land owner or person, site location, types of contaminants and status of contamination. Once the contaminated land has been remediated and the findings demonstrate that the remediation order has been complied with, the competent authority must inform the Minister, who will change the status of the remediation and notify the Registrar of Deeds.

The remediation of contaminated land was removed as a listed activity from Category A of the Waste Management Activities List. This means that a waste management license is no longer needed for this activity.

Q.8 Implementation strategy

- Eskom, in order to determine the presence of contaminated land, must conduct due diligence investigations prior to any property acquisition. The due diligence investigations should determine the condition of the land and the current liabilities and alert a purchaser to possible future obligations.
- Implementation of the Provision will be phased approached:
    - Phase 1 will be a desktop study of all Eskom Divisions operating high risk activities, initial investigations and a preliminary risk assessment.
    - Phase 2 will be a detailed investigations, testing for site characterisation (doing the soil screening tests to check contaminants in the soil) and risk quantification for certain identified sites and
    - Phase 3 will be an evaluation of remediation objectives and a proposed remediation plan, supported by control and monitoring measures for the activities.
- Divisions must identify high risk activities (e.g., underground fuel storage facilities, pollution control dams, waste disposal sites, oil storage areas and transformer storage yards) at their sites.
- The Waste Centre of Excellence will develop a standardised template for the sourcing of above information.
- Based on the above information regarding the site, Eskom will compile an Eskom contaminated land register, including possibly a preliminary site assessment report for certain sites. The Register will be submitted to the Authorities.
- The assessment will be done in accordance with the requirements as stipulated in the norms and standards for the remediation of the contaminated land. That is, the Soil Screening values will be determined to check if the land is contaminated.

- Should any Eskom site qualify as contaminated, a remedial order will be issued and the land will be recorded in the National Contaminated Land Register by the Minister.
- Eskom will be required to develop a remedial plan to remediate the contaminated land.