CDUS 1662

COMMITTEE DRAFT UGANDA STANDARD

First Edition
2017-mm-dd

Waste management — requirements

Reference number
CDUS 1662: 2017

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Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to co-ordinate the elaboration of standards and is

(a) a member of International Organisation for Standardisation (ISO) and

(b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and

(c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of key stakeholders including government, academia, consumer groups, private sector and other interested parties.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

The committee responsible for this document is Technical Committee UNBS/TC 16, *Petroleum*, Subcommittee SC 3, *Petroleum Management and Health Safety Security and Environment.*

Introduction

Waste management refers to all the activities and actions required to manage waste from its generation to its final disposal. This includes amongst other things, collection, storage, transportation, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling.

Waste can be generated during the extraction of raw materials, processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, industrial and commercial), agricultural, and social (health care, household hazardous wastes, sewage sludge),mining and petroleum. Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics.

Waste management — requirements

1 Scope

This Committee Draft Uganda standard covers the management of hazardous waste and non- hazardous waste. This standard covers amongst other things, collection, storage, transportation, treatment and disposal of waste. It also includes provisions for monitoring and regulation of waste.

The standard applies to activities that generate, store, or handle any quantity of waste across a range of industry sectors.

2 Normative references

The following referenced documents referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

National Environment Act 1995

US ISO 14001, *Environmental management systems — Requirements with guidance for use (2nd edition)*

Petroleum (Exploration, Development and Production) Act 2013

The National oil and gas policy 2008

National Environment (Petroleum waste management regulations)

The Petroleum refining conversion transportation Act 2013

Occupational Health and Safety Act, 2006

National Environment (Waste Management) Regulations

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
biological treatment
process of transforming waste into another form or reducing the toxicity or Biological Oxygen Demand (BOD) through a biological process

3.2
chemical treatment
process of transforming waste into another form or reducing the toxicity through a chemical process

3.3
composting
natural biological process, carried out under controlled aerobic conditions (requires oxygen). In this process, various microorganisms, including bacteria and fungi, break down organic matter into simpler substances. The effectiveness of the composting process is dependent upon the environmental conditions present within the composting system i.e. oxygen, temperature, moisture, material disturbance, organic matter and the size and activity of microbial populations.

3.4
energy recovery (Waste to Energy)
conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion, and landfill gas (LFG) recovery. This process is often called waste-to-energy (WTE).

3.5
hazardous waste
shares the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed. Wastes may also be defined as “hazardous” by local regulations or international conventions, based on the origin of the waste and its inclusion on hazardous waste lists, or based on its characteristics.

3.6
incineration
disposal method in which solid organic wastes are subjected to combustion so as to convert them into residue and gaseous products.

3.7
landfill
place to dispose of refuse and other waste material by burying it and covering it over with soil, especially as a method of filling in or extending usable land.

3.8
monitoring and regulatory review framework
part of the environmental management plan which establishes baseline before any waste management installations. Air and water monitoring systems shall be installed at waste storage /treatment/disposal facilities to monitor any environmental risks arising from activities at the facility. Reports shall be submitted to respective authorities at pre-defined intervals during construction, operations and post-closure phases of the project. The respective authorities shall independently audit the facility at least once a year until the end of the post-closure monitoring period.

3.9
non-hazardous (solid) wastes
any garbage or refuse. Examples of such wastes include domestic trash and garbage; inert construction / demolition materials; refuse, such as metal scrap and empty containers (except those previously used to contain hazardous materials which should, in principle, be managed as a hazardous waste); and residual waste from industrial operations, such as boiler slag, clinker, and fly ash.

3.10
physical treatment
process of transforming waste into another form or reducing the toxicity through a physical process such as filtration, flotation, gravity separation, adsorption, and other techniques.

3.11
plasma gasification
process in which the waste's molecular bonds are broken down as result of the intense heat in the vessels and the elemental components.

3.12
recycling
process of converting waste materials into reusable materials and objects

3.13
resource recovery
systematic diversion of waste, which was intended for disposal, for a specific next use. It is the processing of recyclables to extract or recover materials and resources, or convert to energy.

3.14
sludge
material from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial operations needs to be evaluated on a case-by-case basis to establish whether it constitutes a hazardous or a non-hazardous waste

3.15
thermal treatment
application of heat to waste

3.16
vermin-composting
process that relies on earthworms and microorganisms to help stabilize active organic materials and convert them into a valuable soil amendment and source of plant nutrients.

3.17
waste
any solid, liquid, or contained gaseous material that is being discarded by disposal, recycling, burning or incineration. It can be a by-product of a manufacturing process or an obsolete commercial product that can no longer be used for intended purpose and requires disposal.

4 Requirements of waste storage sites

4.1 General

Facilities that generate and store wastes shall practice the following:

a) establish a waste management framework at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences;

b) establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes;

c) avoid or minimize the generation of waste materials, as far as practicable, and where waste generation cannot be avoided but has been minimized, recovering and reusing waste;

d) where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner; and

e) establish a monitoring and regulatory review framework during operation and post closure.

4.2 Temporary waste storage sites

Temporary waste storage sites shall meet the following requirements:

a) ensure that impacts on the environment are avoided or minimised as far as practicable;

b) ensure that there is no risk to human health as a result of waste;

c) prevent the loss of properties of recycled waste as a result of improper collection and storage;

d) prevent littering;

e) minimise the risk of fire from stored waste;

f) undertake a waste inventory and monitor waste management;

g) ensure ease of waste disposal ;and

h) ensure segregation/identification/classification of waste.

4.3 Permanent waste storage sites

Permanent waste storage sites shall meet the following requirements:

a) radioactive wastes are stored so as to avoid any chance of radiation exposure to people, or any pollution;

b) the radioactivity of the wastes decays with time, providing a strong incentive to store high-level wastes for about 50 years before disposal;

5 Types of wastes

5.1 General

Waste from the different activities can be hazardous or non-hazardous

5.2 Hazardous waste materials

Hazardous wastes include those identified as either potentially harmful to human health or the environment, typically with the potential to lead to long term contamination. It is likely that the majority of these wastes will arise during the operation of construction vehicles, plant and equipment, and utilisation of potentially hazardous raw materials.

The following hazardous wastes shall be produced as a result of different activities:

a) spent solvents and oily rags;

b) packaging with residues of hazardous substances (e.g. paints, solvents or coatings);

c) clinical wastes from first aid facilities or on-site clinics;

d) oily residues or spent filters from surface water treatment system;

e) fluorescent tubes;

f) chemical containers;

g) used lubricating oil;

h) sludge from cleaning out refuelling tanks;

i) used batteries (such as nickel-cadmium or lead acid); and

j) lighting equipment, such as lamps or lamp ballasts.

5.3 Non-hazardous waste

This type of waste is likely to consist primarily of:

a) waste from vegetation clearance along the pipeline construction corridor and landfill facility;

b) surplus excavated spoil from the pipeline construction corridor and landfill facility;

c) material excavated from the micro-tunnelling operations;

d) packaging (paper, plastic, metal and wood) from construction materials received at the construction sites;

e) welding waste and metal swarf resulting from jointing of pipeline sections;

f) surplus, damaged and out-of-specification construction materials, including concrete and other inert materials;

g) food waste;

h) empty gas bottles and canisters; and

i) other general wastes from construction, businesses, industry and households.

6 Waste management

6.1 General

The general waste management practices shall include the following:

a) waste minimisation and prevention;

b) identification and segregation of waste materials at source

c) recycling and reuse of suitable materials;

d) treatment and disposal of specific waste streams;

6.2 Hazardous waste management

In addition to the waste management practices applicable to general wastes, the following issues specific to hazardous wastes shall be considered:

a) understanding potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle;

b) ensuring that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled;

c) ensuring compliance with applicable local and international regulations;

d) hazardous waste shall be stored so as to prevent or control accidental releases to air, soil, and water resources in area location where

e) preparing and implementing spill response and emergency plans to address their accidental release

f) avoiding underground storage tanks and underground piping of hazardous waste and

6.3 Non-hazardous waste management

The following waste management practices shall apply to non-hazardous wastes;

a) use of organic bags instead of plastic will greatly reduce the amount of waste you bring into your house;

b) buy food that has less packaging; and

c) carry out vermin composting.

7 Waste management planning

Facilities that generate waste shall characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements.

Effective planning and implementation of waste management strategies shall include:

a) review of new waste sources during planning, siting, and design activities, including during equipment modifications and process alterations, to identify expected waste generation, pollution prevention opportunities, and necessary treatment, storage, and disposal infrastructure;

b) collection of data and information about the process and waste streams in existing facilities, including characterization of waste streams by type, quantities, and potential use/disposition;

c) establishment of priorities based on a risk analysis that takes into account the potential EHS risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner;

d) definition of opportunities for source reduction, as well as reuse and recycling;

e) definition of procedures and operational controls for on- site storage; and

f) definition of options / procedures / operational controls for treatment and final disposal

8 Waste prevention

Processes shall be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated in accordance with the following strategy:

a) substituting raw materials or inputs with less hazardous or toxic materials, or with those where processing generates lower waste volumes;

b) applying manufacturing process that convert materials efficiently, providing higher product output yields, including modification of design of the production process, operating conditions, and process controls;

c) instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off- specification, contaminated, damaged, or excess to plant needs;

d) instituting procurement measures that recognize opportunities to return usable materials such as containers and which prevents the over ordering of materials and

e) minimizing hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed

9 Waste storage

Hazardous waste shall be stored so as to prevent or control accidental releases to air, soil, and water resources. The following shall be put into consideration:

a) waste shall be stored in closed containers away from direct sunlight, wind and rain to prevent commingling or contact between incompatible wastes, and allow for inspection between containers to monitor leaks or spills;

b) where liquid wastes are stored, secondary containment systems shall be constructed with materials appropriate for the wastes being contained and adequate to prevent loss to the environment. For volumes of waste greater than 220 liters, the available volume of secondary containment shall be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in that specific location;

c) provision of adequate ventilation where volatile wastes are stored;

d) hazardous waste storage activities shall also be subject to special management actions, conducted by employees who have received specific training in handling and storage of hazardous wastes;

e) provision of readily available information on chemical compatibility to employees, including labeling each container to identify its contents;

f) limiting access to hazardous waste storage areas to employees who have received proper training;

g) clearly identifying (label) and demarcating the area, including documentation of its location on a facility map or site plan;

h) preparing and implementing spill response and emergency plans to address their accidental release;

i) avoiding underground storage tanks and underground piping of hazardous waste ;and

j) conducting periodic inspections of waste storage areas and documenting the findings

10 Waste transportation

On-site and Off-site transportation of waste shall be conducted so as to prevent or minimize spills, releases, and exposures to employees and the public. All waste containers designated for off-site shipment shall be secured and labelled with the contents and associated hazards, be properly loaded on the transport vehicles before leaving the site, and be accompanied by a shipping paper

11 Waste treatment

11.1 General

Treatment of waste is a method which reduces the volume, mass and/or toxicity prior to disposal. Common methods of treatment are thermal, physical, chemical, and biological processes.

11.1.1 Thermal treatment

Combustion can transform the waste into ash (and gases) and therefore reduce the volume of waste to be disposed. A further example of thermal treatment is the incineration of waste to extract/remove contaminants. This requires the use of an incinerator that is optimized to have a controlled burn and temperature to facilitate complete combustion of contaminants and which is equipped to control emissions.

11.1.2 Chemical treatment

An example of chemical treatment is the addition of lime to acidic mine waters to neutralize the water and precipitate metals.

11.1.3 Biological treatment

Land farming and phytoremediation are examples of biological treatment that involve reduction of contaminant concentrations from impacted soil by microorganisms and plants

11.1.4 Physical treatment

Whereas biological, thermal, and chemical treatments often destroy the toxic chemical constituents of waste, physical treatment does not. Instead, physical treatment typically results in a waste stream that is easier to manage. For example, the removal of suspended particles in water within a settling pond may result in the release of cleaner decant water. The sludge remaining within a settling pond may need to be managed further as a waste product that is generated within the physical treatment process.

12 Waste disposal

Disposal is the final waste management alternative to be considered after incorporating all practical source reduction, recycling, and treatment options.

12.1 Conditions for both on-site and off-site disposal facilities

The following factors shall be considered when evaluating both on site and offsite disposal facilities

12.1.1 General site conditions

Area-wide topographical, hydrological, and geological features, as well as sources of usable water, should be reviewed. Also, current and probable future activities around the disposal site should be evaluated.

12.1.2 Hydrological conditions

A hydrological review should identify the location, size, and direction of flow for existing surface water bodies and aquifers characterized as an Underground Source of Drinking Water(USDW)

12.1.3 Area rainfall or net precipitation conditions

Historical rainfall and distribution data should be evaluated to establish soil loading conditions for land spreading, speed of reserve pit drying, net evaporation rates, and ph overtopping potential.

12.1.4 Soil conditions and loading considerations

Soil conditions should be checked since they will affect decisions on loading for land spreading and liners for pits. For example, in high clay content and permafrost areas, liners may be unnecessary for reserve pits. In other areas, liners may be appropriate.

12.1.5 Drainage areas

Natural or existing drainage pattern should be determined. Drainage devices needed to control water flow into, onto, or from facility systems should be identified.

12.1.6 Presence of special conditions

Environmentally sensitive conditions such as wetlands, historical or archaeological sites, protected habitants, or the presence of endangered species should be identified. Proximity to urban areas also affects disposal decisions

12.1.7 Air quality

The potential air quality impact of solid waste management facilities should be considered

In addition to the recommendations for treatment and disposal applicable to general wastes, the following issues specific to hazardous wastes should be considered:

12.2 Commercial or government waste contractors

In the absence of qualified commercial or government-owned waste operators (taking into consideration proximity and transportation requirements), the following shall be considered:

a) facilities generating waste shall:

   a) have the technical capability to manage the waste in a manner that reduces immediate and future impact to the environment;

   b) have all required permits, certifications, and approvals, of applicable government authorities and

   c) have been secured through the use of formal procurement agreements

b) project sponsors shall:

   a) install on-site waste treatment or recycling processes; and

   b) as a final option, constructing facilities that will provide for the environmental sound long-term storage of wastes on-site or at an alternative appropriate location up until external commercial options become available.

13 Monitoring of waste

When significant quantities of hazardous wastes are generated and stored on site, monitoring activities shall include:

a) regular inspection of all waste storage collection and storage areas for both hazardous and non hazardous for evidence of accidental releases and to verify that wastes are properly labelled and stored.

b) inspection of vessels for leaks, drips or other indications of loss;

c) verification of locks, emergency valves, and other safety devices for easy operation (lubricating if required and employing the practice of keeping locks and safety equipment in standby position when the area is not occupied);

d) checking the operability of emergency system;

e) documenting results of testing for integrity, emissions, or monitoring stations (air, soil vapor, or groundwater);

f) documenting any changes to the storage facility, and any significant changes in the quantity of materials in storage;

g) regular audits of waste segregation and collection practices;

h) tracking of waste generation trends by type and amount of waste generated, preferably by facility department;

i) waste at the beginning of generation of a new waste stream, and periodically documenting the characteristics and proper management of the waste, especially hazardous wastes;

j) periodic auditing of third party treatment and disposal services including re-use and recycling facilities when significant quantities of hazardous wastes are managed by third parties. Whenever possible, audits should include site visits to the treatment storage and disposal location;

k) regular monitoring of groundwater quality in cases of hazardous waste on site storage and/or pre-treatment and disposal; and

l) keeping manifests or other records that document the amount of waste generated and its destination.

During record keeping, the following shall be considered:

a) name and identification number of the material(s) composing the hazardous waste;

b) physical state (i.e., solid, liquid, gaseous or a combination of one, or more, of these); and

c) quantity (e.g., kilograms or liters, number of containers)

14 Waste management options

14.1.1 Reduce

The easier method of waste management is to reduce creation of waste materials thereby reducing the amount of waste going to landfills. Source reduction can be done through recycling old materials like jar, bags, repairing broken items instead of buying new one, avoiding use of disposable products like plastic bags, reusing second hand items, and buying items that uses less designing.

14.1.2 Reuse

Recoverable materials that are organic in nature, such as plant material, food scraps, and paper products, can be recovered through composting and digestion processes to decompose the organic matter. The resulting organic material is then recycled as mulch or compost for agricultural or landscaping purposes. In addition,

waste gas from the process (such as methane) can be captured and used for generating electricity and heat (CHP/cogeneration) maximising efficiencies. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter.

14.1.3 Recycle

The materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, a procedure called kerbside collection. In some communities, the owner of the waste is required to separate the materials into different bins (e.g. for paper, plastics, metals) prior to its collection. In other communities, all recyclable materials are placed in a single bin for collection, and the sorting is handled later at a central facility. The latter method is known as single-stream recycling.

The most common consumer products recycled include aluminum such as beverages cans, copper such as wire, steel from food and aerosol cans, old steel furnishings or equipment, rubber tyres, polyethylene and PET bottles, glass bottles and jars, paperboard cartons, newspapers, magazines and light paper, and corrugated fiberboard boxes.

PVC, LDPE, PP, and PS (see resin identification code) are also recyclable. These items are usually composed of a single type of material, making them relatively easy to recycle into new products. The recycling of complex products (such as computers and electronic equipment) is more difficult, due to the additional dismantling and separation required.

15 Waste treatment technologies

15.1 Composting

Composting, normally used for organic farming, occurs by allowing organic materials to sit in one place for months until microbes decompose it. Composting is one of the best methods of waste treatment as it can turn unsafe organic products into safe compost.

These activities are performed at a resource recovery facility. Resource recovery is not only environmentally important, but it is also cost effective. It decreases the amount of waste for disposal, saves space in landfills, and conserves natural resources.

Resource recovery (as opposed to waste management) uses LCA (life cycle analysis) attempts to offer alternatives to waste management. For mixed MSW (Municipal Solid Waste) a number of broad studies have indicated that administration, source separation and collection followed by reuse and recycling of the non-organic fraction and energy and compost/fertilizer production of the organic material via anaerobic digestion to be the favoured path.

15.2 Incineration

This method is useful for disposal of residue of both solid waste management and solid residue from waste water management. This process reduces the volumes of solid waste to 20 %to 30 % of the original volume. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incinerators convert waste materials into heat, gas, steam, and ash.

Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. It is recognized as a practical method of disposing of certain hazardous waste materials (such as biological medical waste). Incineration is a controversial method of waste disposal, due to issues such as emission of gaseous pollutants.

15.3 Plasma gasification

Plasma is a primarily an electrically charged or a highly ionized gas. Lighting is one type of plasma which produces temperatures that exceed 12,600 °F. With this method of waste disposal, a vessel uses

characteristic plasma torches operating at +10,000 °F which is creating a gasification zone till 3,000 °F for the conversion of solid or liquid wastes into a syngas**.**This form of waste disposal provides renewable energy and an assortment of other fantastic benefits.

15.4 Energy recovery (Waste to Energy)

Energy recovery from waste is part of the non-hazardous waste management hierarchy. Using energy recovery to convert non-recyclable waste materials into electricity and heat, generates a renewable energy source and can reduce carbon emissions by offsetting the need for energy from fossil sources as well as reduce methane generation from landfills. Globally, waste-to-energy accounts for 16 % of waste management.

The energy content of waste products can be harnessed directly by using them as a direct combustion fuel, or indirectly by processing them into another type of fuel. Thermal treatment ranges from using waste as a fuel source for cooking or heating and the use of the gas fuel (see above), to fuel for boilers to generate steam and electricity in a turbine. Pyrolysis and gasification are two related forms of thermal treatment where waste materials are heated to high temperatures with limited oxygen availability. The process usually occurs in a sealed vessel under high pressure. Pyrolysis of solid waste converts the material into solid, liquid and gas products. The liquid and gas can be burnt to produce energy or refined into other chemical products (chemical refinery). The solid residue (char) can be further refined into products such as activated carbon. Gasification and advanced Plasma arc gasification are used to convert organic materials directly into a synthetic gas (syngas) composed of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam. An alternative to pyrolysis is high temperature and pressure supercritical water decomposition (hydrothermal monophasic oxidation).

15.5 Pyrolysis

During pyrolysis, the molecules of objects are subjected to very high temperatures leading to very high vibrations. Therefore, every molecule in the object is stretched and shaken to an extent that the molecule starts breaking down. The rate of pyrolysis increases with temperature. In industrial applications, temperatures are above 430 °C (800 °F). Fast pyrolysis produces liquid fuel for feedstocks like wood. Slow pyrolysis produces gases and solid charcoal. Pyrolysis hold promise for conversion of waste biomass into useful liquid fuel. Pyrolysis of waste plastics can produce millions of litres of fuel. Solid products of this process contain metals, glass, sand and pyrolysis coke which cannot be converted to gas in the process

15.6 Sanitary Landfills

The image shows a cross-section of a municipal solid waste Sanitarylandfill.

The sanitary Landfill is the most popularly used method of waste disposal used today. This process of waste disposal focuses attention on burying the waste in the land without polluting the environment and underground water. Landfills are found in all areas. There is a process used that eliminates the odors and dangers of waste before it is placed into the ground. While it is true this is the most popular form of waste disposal it is certainly far from the only procedure and one that may also bring with it an assortment of space.

This method is becoming less these days although, thanks to the lack of space available and the strong presence of methane and other landfill gases, both of which can cause numerous contamination problems. Many areas are reconsidering the use of landfills

Some materials may be banned from disposal in Municipal Solid Waste Land Fills (MSWLFs), including common household items like paints, cleaners/chemicals, motor oil, batteries and pesticides. Leftover portions of these products are called household hazardous waste. These products, if mishandled, can be dangerous to your health and the environment. Many MSWLFs have a household hazardous waste drop-off station for these materials.

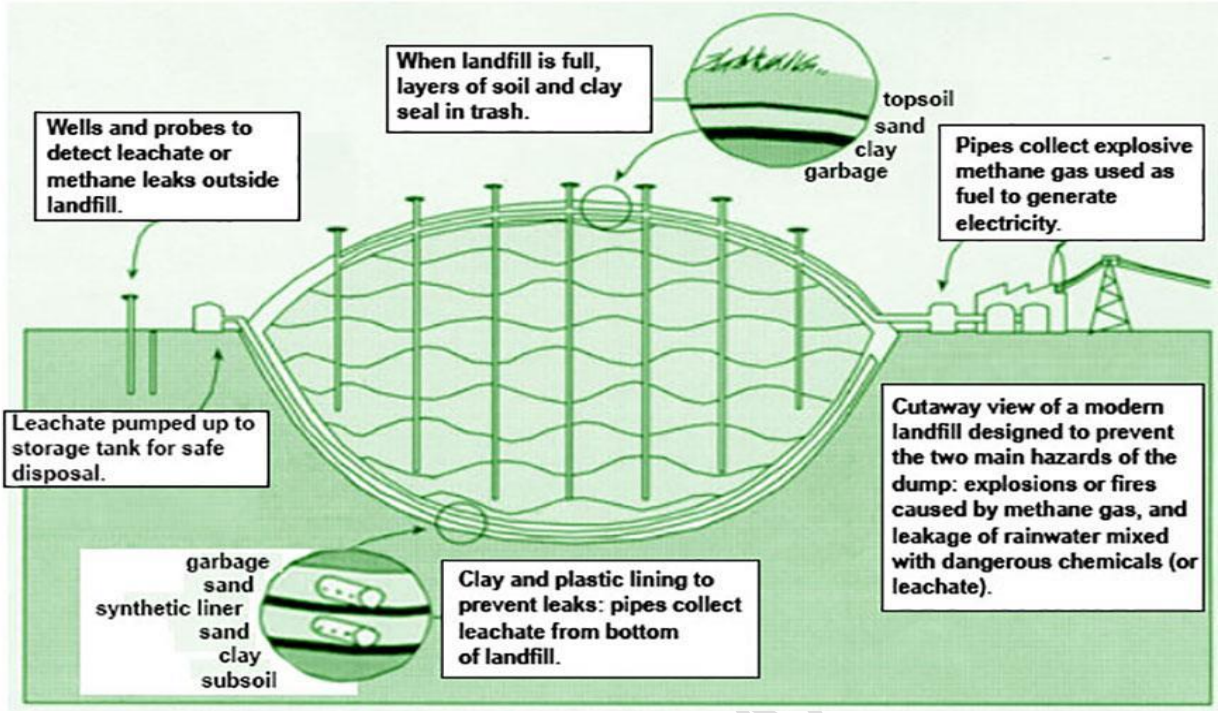

Figure xxxx showing a cross-section of a municipal solid waste landfill

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CDUS 1662: 2017

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