



MIDDELBURG LANDFILL SITE

WASTE IMPACT REPORT

AUGUST 2026

**DEPARTMENT: ENVIRONMENTAL AND
SOLID WASTE MANAGEMENT**



EXECUTIVE SUMMARY

The Waste Impact Assessment Report is compiled by Steve Tshwete Local Municipality (STLM) in support of the Middelburg Landfill Site Review and Variation process. STLM is the permit holder of the landfill site and is currently operating and managing the facility in-house. The site is within Nkangala District Municipality in Mpumalanga province.

This report presents the findings of the waste impact assessment undertaken through a combination of desktop review, field verification and spatial sensitivity mapping. The vegetation occurring on and around the site corresponds with Rand Highveld Grassland Gm 11. It has a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes.

Most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the *Asteraceae*, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent.

In terms of the Mpumalanga Biodiversity Sector Plan (2014), the assessed site falls within the Critical Biodiversity Area (CBA): Wetlands, Mpumalanga Highveld Wetlands and Ecological Support Area (ESA): Important Sub-catchments, indicating that the area contributes to the maintenance of ecological processes, water resources and landscape-level biodiversity support functions.

The landfill site operation may be having negative impacts on the environment through its daily operational activities such as waste transportation and disposal, operation of equipment and machinery, waste compaction, etc.; however, with mitigation measures in place together with monitoring and maintenance measures and recommendations provided, the impacts prove to be of low significance.



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1. INTRODUCTION

1.1. Background

The Middelburg Landfill Site is a permitted/licensed waste disposal facility owned by Steve Tshwete Local Municipality. The site was previously Permitted under section 20 of the environmental conservation act, the facility is a GMB- with Permit Number 16/2/7/B100/D33/Z1/P412 issued on 16 July 2001 and was later issued with a new operating waste management license in terms of the National Environmental Management Waste Act (NEM: WA) with License Number 17/04/WL/MP313/12/01 issued in 17 March 2014.

Middelburg Landfill Site is operated and managed by the Steve Tshwete Local Municipality personnel from March 2026, in line with the conditions set out in the license and minimum requirements of waste disposal by landfill. It was previously operated and managed by a service provider, Inkunzi Waste Management.

1.2. Objectives

The primary objective of a landfill site waste impact report is to evaluate, predict, and manage the environmental, health, and social consequences of solid waste disposal. It ensures regulatory compliance, protects natural resources, and minimizes risks to nearby communities.

Environmental Protection

- Assess groundwater: Check for toxic liquid run-off (leachate) reaching local water tables.
- Monitor air quality: Measure dangerous gases like methane and carbon dioxide.
- Protect soil health: Prevent heavy metals and chemicals from ruining local earth and plants.

Public Health & Safety

- Reduce health risks: Lower disease threats from pests, odors, and airborne toxins.
- Protect neighbors: Set safe buffer zones between waste sites and homes.

Legal & Operational Control

- Ensure compliance: Meet local laws, environmental permits, and waste licenses.
- Plan site life: Manage daily operations, waste volume limits, and future closure steps.



1.3. Waste Management Hierarchy

The objects of the Waste Act are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. Therefore, the mine follows the waste management hierarchy approach. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority. All stakeholders must apply the waste management hierarchy in making decisions on how to manage waste

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimizes their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the waste management hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycles a product when it reaches the end of its life span. In this way, it becomes inputs for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the waste management hierarchy: recovery.

Recovery involves reclaiming particular components or materials or using the waste as a fuel.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

Where the quantity of waste cannot be reduced during production, the purpose of implementing the waste management hierarchy is to use waste as a resource and divert these potential resources from landfill. Although landfills are widely considered the most affordable way to manage waste, this view does not take into account factors such as the environmental impacts of landfills; the costs of developing and maintaining additional landfill capacity to accommodate the increasing rate of waste disposal; and the cost of closing and remediating the landfill.

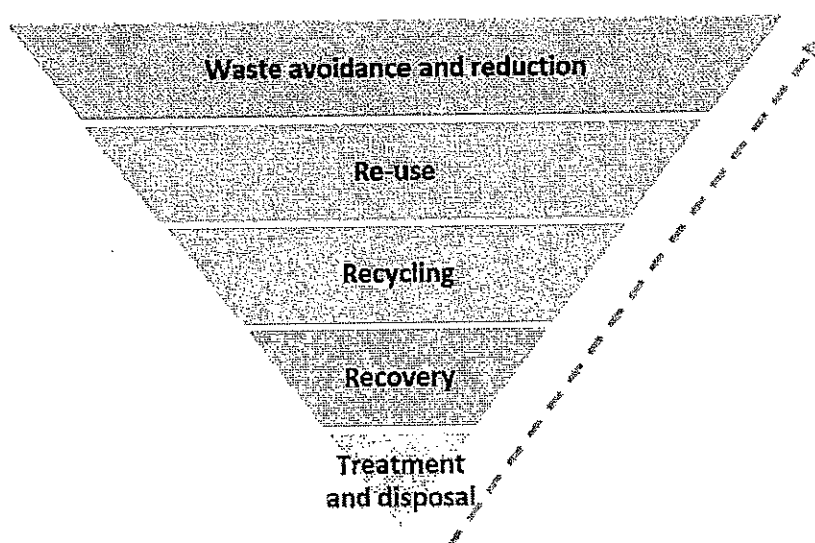


Figure 1: Waste management hierarchy

2. WASTE MANAGEMENT PRINCIPLES

Underlying principles or factors for this waste management plan are as follows:

a) The 'polluter pays principle'

The National Environmental Management Act, (NEMA), Act 107 of 1996, states that all costs associated with the management of waste should be borne by the persons who generated the waste. Such costs may include the following:

- waste minimization;
- waste separation;
- containing, treating and disposing of waste; and
- rectifying environmental harm caused by waste.

b) Cradle to grave

This is a process where a waste generator is responsible for and develops intervention program throughout the lifecycle until final disposal.

c) Co-ordination

d) This is a process where a waste generator ensures that waste management is integrated across all sectors of the organization.



e) Capacity building and education

To successfully implement its WMP, a waste generator must recognize the need to educate its employees and other stakeholders on best waste management practice for effective participation in achieving integrated waste management.

f) Accountability

A waste generator is responsible for general environmental policy formulation, monitoring and enforcement. This will ensure accountability for waste generated.

g) Ensuring Sustainable Development

This WMP needs to achieve a better balance between economic prosperity, social equity and environmental protection i.e., making sure that sustainable development takes place in the context of 'living today with tomorrow in mind'.

3. LEGAL FRAMEWORK

The Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa (Act 108 of 1996) is the supreme law of the land, of which all law, including environmental waste management planning, must comply with the Constitution. The Bill of Rights is contained in Chapter 2 of the Constitution Act, No. 108 of 1996 and outlines the provisions of the environmental right. In terms of section 24 of the Act, everyone has the right: (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management Act, 1998 (Act No. 107 of 1998)

The National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) is an overarching statute concerned with integrated environmental management and the underlying principles by which environmental management must be undertaken. NEMA provides a legislative framework for all environmental management Acts in South Africa. NEMA key considerations are mainly the following:

- Acts as framework legislation giving effect to section 24 of the Constitution.



- Provides for co-operative environmental governance.
- Ensures public participation in environmental decision-making.
- Seeks to alleviate environmental injustice (inequality and poverty that are the causes and results of environmentally harmful practices).
- Ensures sustainable development.

National Environmental Management: Waste Act, 2008 (Act No.59 of 2008)

Aims to reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

Regulations in terms of the Waste Act:

- National Waste Information Regulations
- National Waste Classification and Management System's Regulations
- National Norms and Standards for Disposal of Waste by Landfill Site
- Remediation of contaminated land
- Standards of soil quality

National Environmental Management Waste Amendment Act, 2014 (Act No 26 of 2014)

The National Environmental Management: Waste Amendment Act (NEM: WAA) (Act No. 26 of 2014) came into effect on the 2nd of June 2014 in order to amend and rectify the short comings of the NEM: WA

Draft National Waste Management Strategy, 2026

The draft NWMS 2026 provides government policy and strategic interventions for the waste sector and is aligned to the Sustainable Development Goals (SDGs) of Agenda 2030, adopted by all United Nations (UN) member states in January 2016. It is also responsive to South Africa's National Development Plan (NDP): Vision 2030, which is our country's specific response to, and integration of the SDGs into our overall socioeconomic development plans leading to zero waste



in landfills; cleaner communities, well-managed and financially stable waste services, and a culture of zero tolerance of pollution, litter and illegal dumping.

National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act contains a number of provisions that impact on waste management, including the disposing of waste in a manner, which detrimentally impacts on a water resource and the discharge of waste into a water resource. The Act allows the Minister to make regulations for:

- Prescribing waste standards, which specify the quantity, quality and temperature of waste that may be discharged or deposited into or allowed to enter a water resource;
- Prescribe the outcome or effect, which must be achieved through management practices for the treatment of waste before it is discharged or deposited into or allowed to enter a water resource; and
- Requiring that waste discharged or deposited into or allowed to enter a water resource be monitored and analysed according to prescribed mechanisms.

Part 5 of the National Water Act (36 of 1998) deals with pollution of water resources following an emergency incident, such as an accident involving the spilling of a harmful substance that finds or may find its way into a water resource. In terms of Section 30 of NEMA and Section 20 of the National Water Act, the responsibility for remedying the situation rests with the person responsible for the incident or the substance involved. If there is a failure to act, the relevant Catchment Management Agency may take the necessary steps and recover the costs from every responsible person.

Hazardous Substances Act, 1973 (Act No. 15 of 1973)

This legislation aims to address substances that are deemed hazardous, in order to regulate and prohibit the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances. In terms of waste management, Section 29 of the Hazardous Substances Act stipulates that the Minister has the designated authority to authorize, regulate or prohibit the dumping of hazardous substances. Industries that generate hazardous waste must produce an Industrial Waste Management Plan

National Health Act, 2003 (Act No. 61 of 2003)

The Act provides measures for the promotion of health, for the rendering of health services and defines duties of certain authorities which render health services in the Republic. Section 20 sets out the duties and powers of LMs. It provides that every Local Government is obliged to take



measures to maintain its municipality in a clean and hygienic condition and to prevent the occurrence of any nuisance, unhygienic or offensive condition or any other condition, which could be of danger to the health of any person. A "nuisance" includes any accumulation of refuse or other matter that is offensive or is injurious or dangerous to health.

The local government is obliged to abate the nuisance or remedy the condition and to prevent the pollution of any water intended for the use of the inhabitants of its municipality. Draft regulations for the control of environmental conditions constituting a danger to health or a nuisance were published in Government Notice Regulation 21 of 14 January 2000. In terms of the proposed regulations, registration is required for: concerns that to carry out a scheduled trade, including waste incineration, waste (including Health Care Risk Waste) disposal sites and waste collecting, sorting, treating, or processing sites.

National Norms and Standards under the National Environmental Management: Waste Act 2008 (Act No. 59 of 2008),

- National Norms and Standard for the remediation of contaminated land and soil quality, 2014
- Norms and standards for the scrapping and recovery of motor vehicles, 2013
- Norms and standards for extraction, flaring and recovery of landfill gas, 2013
- National norms and standards for sorting, shredding, grinding, crushing, screening or baling of general waste, 2017
- National norms and standards for the storage of waste, 2013
- National norms and standards for organic waste composting, 2021
- National norms and standards for the treatment of organic waste, 2022
- National domestic waste collection standards, 2011

Regulations under the National Environmental Management: Waste Act 2008 (Act No. 59 of 2008),

- National Waste Information Regulations, 2012
- Waste classification and management Regulations, 2013
- Waste Tyre Regulations, 2009
- National Pricing Strategy for Waste Management, 2016

Steve Tshwete Local Municipality Integrated Waste Management By-law, 2022:



The objective of the By-laws is to regulate the collection, removal and disposal of domestic waste and commercial waste by the Municipality in order to ensure efficient and effective provision of this service and to protect health, well-being and the environment.

4. LANDFILL SITE MINIMUM REQUIREMENTS

This section sets out the Minimum Requirements for the operation of landfill sites. In terms of the Environment Conservation Act (Act No. 73 of 1989), only an approved landfill, which has been issued with a Permit in terms of Section 20(1) of the Act, may operate.

The objectives of the Minimum Requirements for landfill operation are:

- To ensure that all waste is disposed of in an environmentally and socially acceptable manner.
- To ensure that the disposal operation is acceptable to those whom it affects.

The operation must thus conform to both the Permit conditions and to the Minimum Requirements associated with the site classification. It is the duty of the Responsible Person to ensure that the Minimum Requirements for the operation of a landfill site are applied to the degree commensurate with its class and hence to the satisfaction of the Department.

N.B: For daily operations (e.g., compaction, soil covering, vectors, dust control, and water monitoring), the rules established under the old Minimum Requirements remain the standard operational benchmark.

4.1. Facilities And Resources Required For Landfill Operation

There must be sufficient facilities and resources to ensure that the landfill operation can conform to both the Permit conditions and the relevant Minimum Requirements. For example, there should be sufficiently trained staff to monitor, control and record incoming waste where required.

4.1.1. Signposting and Road Access

Signs in the appropriate official languages must be erected in the vicinity of the landfill, indicating the route and distance to the landfill site from the nearest main roads. These traffic signs must conform to the requirements of the Road Ordinance. Suitable signs must also be erected on site, to direct vehicle drivers appropriately and to control speed.

A general notice board must be erected at the site entrance. This must also be in the appropriate official languages, stating the names, addresses and telephone numbers of the Permit Holder and the Responsible Person, the hours of operation, and an emergency telephone number. It is of particular importance that the sign clearly states the class of landfill and the types of waste that can be accepted. Wastes that cannot be accepted must also be stated. It must be stated that disposal of non-acceptable waste types is illegal and can lead to prosecution.

Road access to the site must be maintained at all times, in a manner suitable to accommodate the vehicles normally expected to utilize the facility. All roads, particularly on-site roads, must be so surfaced and maintained as to ensure that waste can reach the working face with the minimum of inconvenience in all weather conditions. Two-way traffic must also be possible in all weather



conditions. Unsurfaced roads must be regularly graded and watered to control dust. No mud from the site may be tracked onto public roads.

4.1.2. Controls

Waste acceptance

One of the purposes of the landfill classification system is to ensure that general waste disposal sites receive only the general waste for which they are designed and that all hazardous waste is disposed of only on hazardous waste disposal sites.

Prior to waste being accepted at general waste disposal sites, it must be inspected by suitably qualified staff, and the transporter must confirm that it is general waste. In the case of doubt, any industrial waste should be considered as potentially hazardous until proven otherwise; see Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste. The operator at the working face must also ensure that no hazardous waste (e.g. hazardous liquids, sludges, solids or even sealed drums) is disposed of. Such controls are particularly important at general waste landfill sites in the vicinity of industrial areas. In the event of hazardous waste being intercepted at a general waste landfill site, it must be diverted to a hazardous waste landfill site. The source, vehicle registration and a description of the waste must be reported immediately to the Department.

In the event that medical wastes are intercepted at either a general or a hazardous waste landfill site, it is a Minimum Requirement that the Responsible Person or the Permit Holder immediately contact the Department for a directive in this regard.

Access control

In order to facilitate the above waste acceptance procedures, access to the site must be controlled. It is therefore a Minimum Requirement that vehicle access to a site be limited to a single controlled entrance, to prevent the unauthorized entry and illegal dumping of waste on the site. The site entrance must comprise a lockable gate which must be manned during hours of operation. Additional security, after operating hours, is required at all hazardous waste disposal sites, and general waste disposal sites where appropriate.

In addition to the gate, all sites must have the portion of the site currently in use adequately fenced and/or secured. In the case of medium and large general landfills and hazardous landfills, fences must be 1,8m with an overhang and must be constructed of galvanized steel wire, or of other suitably sturdy and durable material. Where normal fencing is removed or is not practicable because of continued theft despite security measures, barbed wire fences, earth berms and/or shallow trenches must be used to prevent vehicle access. In all events, however, the site boundaries must be clearly demarcated, and measures must be taken to prevent unauthorized vehicle access.

Collection of disposal tariffs

Since the Minimum Requirements increase the standards of waste disposal, they also increase the cost. In order to offset these costs, waste disposal tariffs should be levied and collected at all



landfill sites, from medium-sized upward. Tariffs should be displayed on the noticeboard. They should be based on mass, where a weighbridge exists, or on estimated volumes.

Security

In addition to access control, suitable security must be provided to protect any facilities and plants on site.

It is a Minimum Requirement that unauthorized pedestrian access be strictly prohibited at hazardous waste disposal sites, although this may be difficult in some instances. Primarily for the purpose of protecting public health and safety, waste reclamation and squatting should be discouraged at general waste disposal sites. It is a Minimum Requirement that no reclamation be allowed at hazardous waste disposal sites. Since fencing is not always effective, additional measures may be necessary in order to achieve this Minimum Requirement.

4.1.3. Operating Plan

An Operating Plan is a site-specific document that will be developed as part of the Landfill Permit Application Procedure. It describes the way in which the landfill is to be operated, commencing at the level and detail of daily cell construction and continuing through to the projected development of the landfill with time. Everything pertaining to the operation of a landfill should therefore be included in the Operating Plan, which is subject to regular update.

The Operating Plan would include, inter alia, the phasing, the excavation sequence, the provision of wet weather cells, site access and drainage. It would also include all operation monitoring procedures and a plan for mitigatory actions in response to problems detected by monitoring.

4.1.4. Resources

Adequate facilities, equipment and suitably trained staff are required in order to ensure an ongoing environmentally acceptable waste disposal operation. It is therefore a Minimum Requirement that there be sufficient resources to meet the Minimum Requirements relating to the operation.

Infrastructure

The facilities at a landfill site will vary in accordance with the size of the operation. In the case of a G:C site, only access control would be a Minimum Requirement. Larger sites would typically have services such as water, sewerage, electricity, telephones, security and infrastructure such as weighbridges, site offices and plant shelters. In the case of hazardous waste disposal sites, an on-site laboratory would be a Minimum Requirement.

Plant and equipment

The plant and equipment on site must be commensurate with the size and type of operation. The type of equipment employed for all phases of the operation must therefore be of suitable capacity and construction. Typically, larger sites would have a combination of purpose-built landfill compactors, bulldozers, front-end loaders and trucks to transport cover material. In the case of smaller sites, however, less would be required.



Staff

It is a Minimum Requirement that the operation of all landfill sites be carried out under the direction of a Responsible Person. This may be a gate controller in the case of a G:C site, a site foreman in the case of a G:S site, a site superintendent in the case of a G:M site and a landfill manager with a post-matric or tertiary qualification in the case of a G: L site.

The Responsible Person must, in all cases, be supported by suitably qualified and competent staff. This staff complement would be commensurate with the size and type of the operation, as well as with the facilities and plant involved. Sufficiently qualified staff and back-up are required to ensure that the Minimum Requirements relating to the operation are met. Where applicable, the Responsible Person must also ensure that the requirements of the Occupational Health and Safety Act are met with regard to visitors and site staff.

4.2. Landfill Operation

Waste deposition is considered mainly in terms of sanitary landfill principles. In the case of hazardous waste, however, more stringent waste acceptance procedures, pre-treatment, co-disposal and encapsulation are addressed.

4.2.1. Principles of sanitary landfilling

Landfills must be operated in accordance with the following sanitary landfill operating principles:

- waste must be compacted, and
- covered at the end of each day's operations.

4.2.2. Methods of landfilling

General waste Sanitary landfilling principles can be applied using the following methods:

- Trench system
- Standard cell operation
- Wet weather cell
- Special cells for putrescible waste

4.3. Other Elements of the Operation

4.3.1. Excavation for cover

Where cover is excavated on site, the Responsible Person must ensure that the separation between the floor of the excavation and the wet season high elevation of the ground water, as specified in the design, is maintained. This will ensure that an adequate separation between the future waste body and the ground water will be maintained, should the excavation be used for waste disposal in the future.

4.3.2. Drainage



The principles of landfill site drainage are as follows:

- Upslope run-off water must be diverted away from waste, to prevent water contamination and to minimize leachate generation.
- Where contaminated water or leachate does arise on a site, it must be managed. This means that it must be kept out of the environment. This also applies to the drainage from wash bays and spills at hazardous waste landfills.
- Clean, uncontaminated run-off water must not be permitted to mix with, and increase the volume of, contaminated water.

The minimum requirements of drainage also apply.

4.3.3. Control of nuisances

Nuisances resulting from the landfill operation should be controlled as follows:

Burning of waste

At present, the burning of waste takes place at many small landfills in South Africa, to reduce the volume of waste and its attraction to vermin and livestock. The burning of waste is considered unacceptable, however, because of aesthetics, odours, and the potential of health dangers from air pollution. On account of these adverse impacts, therefore, the Department prohibits the burning of waste at landfill sites.

Possible exceptions to this Minimum Requirement would be G:C and G:S landfills in rural areas, provided that there is at least a 1,000m downwind of residential areas. In such cases, special permission to burn waste must be obtained. This would be subject to the acceptance of the IAPs, the local authority and the Department of Environmental Affairs and Tourism.

Litter

It is a Minimum Requirement that all litter be contained within the site. This may be achieved by applying the sanitary landfill principles of compaction and cover. On sites characterized by high winds, however, movable litter fences are a Minimum Requirement. Windblown litter must be picked up and removed from fences and vegetation on a daily basis.

Odours

Odours must be combatted by good cover application and maintenance. Furthermore, the prompt covering of malodorous waste to reduce odour problems is a Minimum Requirement. In extreme cases, odour suppressants such as spray curtains may be required.

Where breaches in the cover from which significant volumes of landfill gas escape are identified by their odour, proper investigation is a Minimum Requirement. This may be followed by properly engineered passive or active gas venting and flaring, to alleviate odour problems.

Noise

All equipment used on site must conform to the local authority's by-laws concerning noise levels and hours of operation. In the absence of by-laws, national regulations on noise control must be complied with.



Vermin and disease vectors

It is a Minimum Requirement that landfill sites be kept free of vermin. Appropriate measures must be taken to eliminate or minimise disease vectors such as rats or flies.

Dust

Unsurfaced roads and areas with vegetation or unpaved areas, which give rise to dust problems, must be regularly watered to restrict dust to levels which do not pose a nuisance to workers or users of the facility.

4.3.4. Waste reclamation

At present, both uncontrolled salvaging and controlled reclamation take place at many landfills. While the ethic of reclamation from the waste stream is supported, reclamation at landfills can endanger the health and safety of the reclaimers. On account of the risks to health and safety, therefore, the Department discourages waste reclamation at landfill sites. Specifically, it is a Minimum Requirement that no waste reclamation be permitted at hazardous waste sites.

Should the Permit Holder wish to allow controlled reclamation at a general waste disposal site, however, permission can be obtained as part of the Permit Application or as an amendment to an existing Permit. In this case, guidelines and Minimum Requirements are provided, in order to ensure safe and controlled working conditions. Notwithstanding, it is noted that responsibility for the safety of any reclaimers on the site vests with the Permit Holder, who will be required to enter into an indemnity agreement with the Department.

It is a Minimum Requirement that any reclamation operation be formalized in the Operating Plan. This would include regular consultation with and registration of reclaimers and the provision of appropriate safety measures. Safety measures would include the separation of reclamation from compaction and covering activities, and the provision of safety clothing.

4.3.5. Leachate and gas management

In B + landfill sites, significant leachate is generated, and leachate management is mandatory. The design for such sites will include a leachate management system. As with the drainage system, however, the leachate management system requires to be maintained and continuously adapted and developed, as the landfill develops. Where treatment is involved, a whole separate operating procedure must also be adhered to. This procedure would be written up in the Operating Plan.

At B- sites, any sporadic leachate generated on account of unusual circumstances must be both reported to the Department and properly controlled. This could also include leachate recycling. Where a gas management system exists at a site, it must be correctly operated, maintained and monitored to ensure that any landfill gas emanating from the site is properly managed.

4.3.6. Progressive rehabilitation of completed areas



The progressive rehabilitation of landfills by means of capping and the subsequent establishment of vegetation is a Minimum Requirement. Capping should be implemented in all areas where no further waste deposition will take place, and vegetation should commence as soon as possible.

Screening berms are the first areas where vegetation must be established. This ensures that waste disposal operations take place behind vegetated berms. These are extended upwards in advance of the disposal operation to ensure continued screening. This is referred to as the 'rising green wall's approach.

All final levels and slopes must be in accordance with the landfill design and the End-use Plan. Slopes should not be steeper than 1 in 2,5, as this will promote erosion.

4.3.7. Final cover

Immediately on completion of an area, the final cover must be applied. The thickness of the final cover must be consistent and in accordance with the design. The final cover must comprise material capable of supporting the vegetation called for in the End-use Plan. In order to prevent erosion and improve aesthetics, revegetation should commence as soon as possible after applying the final cover.

All covered surfaces on the landfill must be so graded as to promote run-off to prevent ponding. Re-vegetation must commence as soon as is practically possible after the final cover has been placed, in order to rehabilitate on an ongoing basis.

4.3.8. Public Participation in the operation

The standard of operation at a given landfill may be monitored and enforced by the Monitoring Committee. This should include representatives of the Department, the operator and representatives of those affected by the landfill. The objective of this committee is to provide a mechanism whereby the needs and concerns of the IAPs can be addressed in the operation of the facility. In the interests of transparency, IAPs should, through the Monitoring Committee, be given access to the site and information relating to the operation.

5. FACILITY INFORMATION AND DESCRIPTION

5.1. Location

The Middelburg Rietfontein Landfill Site is located on a section of the Remainder of Portion 1 of the Farm Rietfontein 286 JS, in Steve Tshwete Local Municipality, Nkangala District, Mpumalanga Province.

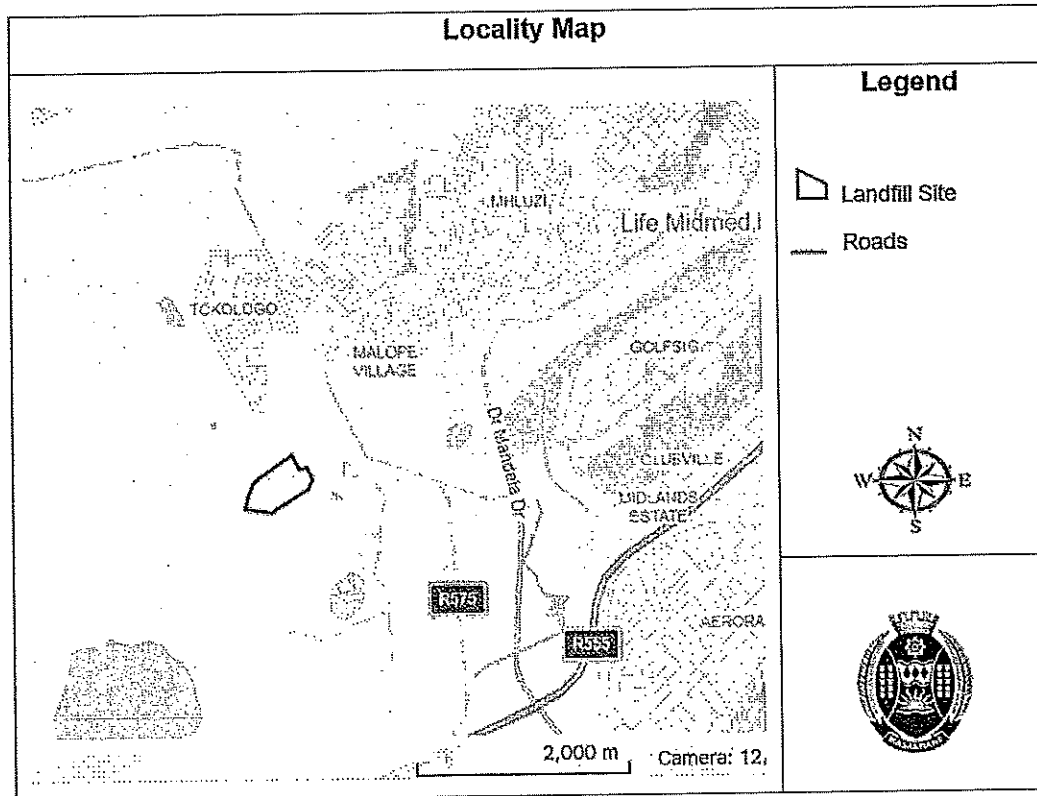


Figure 2: Locality map

5.2. Services and infrastructure

Landfill site infrastructure includes access control buildings, engineered multi-layered bottom liners, leachate collection networks, stormwater diversion systems, gas recovery setups, and final progressive capping layers. These components work collectively to isolate municipal or industrial waste from surrounding groundwater, air, and local ecosystems

Operational and Access Infrastructure

- **Gatehouse and Security:** Perimeter fencing, access gates, and security guardhouses manage entry and prevent unauthorized scavenging.
- **Weighbridge:** Incoming and outgoing trucks are weighed to log tonnages and calculate tipping fees.
- **Service Roads:** Internal paved or gravel roads facilitate heavy vehicle movement, paired with wheel-wash bays to reduce mud tracking onto public routes.
- **Administration and Storage:** Site offices, ablution facilities, and equipment shelters.



- **Water:** Potable water is provided to the site by the Municipality. This water is used for domestic use at the office facilities.
- **Electricity:** Electricity is provided by the municipal power provider. The electricity will be used for all infrastructure on site.
- **Leachate dam:** an engineered basin used to hold leachate water runoff that drains from a waste site or landfill
- **Stormwater Management:** Peripheral berms, cut-off trenches, and retention ponds segregate clean runoff from active tipping zones.

6. BASELINE ENVIRONMENTAL ATTRIBUTES

Vegetation & Landscape Features

The landfill site falls within the Grassland Biome, which covers over 61% of the Mpumalanga province. This highveld environment features cold, dry winters and warm, wet summers, supporting rich herbaceous vegetation, bulbous plants, and specialized local wildlife and wetland systems. Within the biome, the site falls within vegetation unit the Rand Highveld Grassland with vegetation code **Gm 11**.

Rand Highveld Grassland Gm 11

Rand Highveld Grassland Gm 11 has a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the *Asteraceae*, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent.

Geology & Soils

Quartzite ridges of the Witwatersrand Supergroup and the Pretoria Group as well as the Selons River Formation of the Rooiberg Group (last two are of the Transvaal Supergroup), supporting soils of various quality (shallow Glenrosa and Mispah forms especially on rocky ridges), typical of Ba, Bc, Bb and Ib land types.



Climate

Strongly seasonal summer-rainfall, warm-temperate region, with very dry winters. MAP is 654 mm, ranging between 570 mm and 730 mm, slightly lower in the western regions. The coefficient of variation of MAP is 28% in the west and 26–27% in the east, and varies only slightly from 25% to 29% across the unit. The incidence of frost is higher in the west (30–40 days) than in the east (10–35 days). See also climate diagram for Gm 11 Rand Highveld Grassland

Hydrology

The site is within the Middelburg Dam catchment covers an area of 1 576km², but a significant portion of it drains to pans. These pans act as small, isolated catchments which reduces the effective total catchment area draining to Middelburg Dam to 1 401 km². The Klein Olifants River is the most significant river in the Middelburg Dam catchment. The mean annual runoff for the Middelburg Dam catchment is 37.1 million m³/annum. The Middelburg Dam is one of five sub-catchments in the upper Olifants River basin, upstream of Loskop Dam. The Klein-Olifants River, which drains to the Middelburg Dam, forms part of the B100 drainage region. It is an important catchment, not only in context the of water supply to the greater Middelburg area, but also in terms of the flow and pollution load contributions to Loskop Dam. The catchment is impacted on by various land uses including towns and related settlements, coal mining, power generation, agriculture, feedlots, and other industrial activities.

The area is not in proximity to any river; however, according to the 2014 Mpumalanga Biodiversity Sector Plan map, the site falls within a wetland. See the figure below.

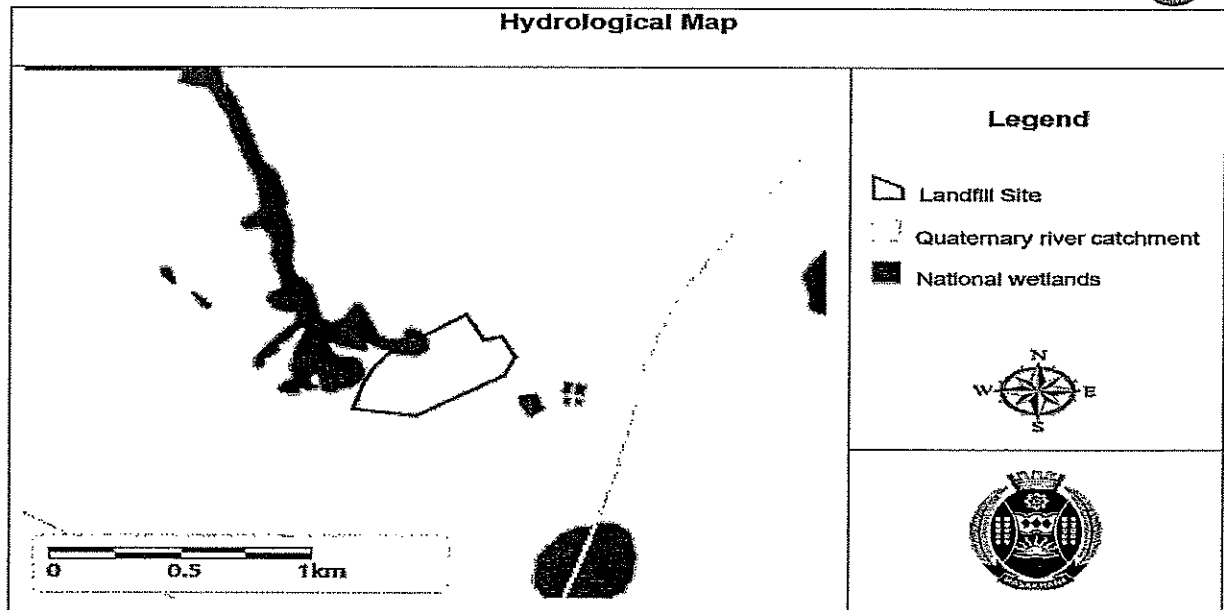


Figure 3: Hydrological map of the Landfill Site

7. WASTE INVENTORY

7.1. Waste Types

Waste Types

Waste is classified into two categories in terms of the National Environmental Management Waste Amendment Act, 2014 (Act No 26 of 2014), namely; General and Hazardous waste.

STLM has one Licensed General landfill site (Middleburg Landfill Site) which only cater for disposal of general waste. This report mainly deals with general waste from domestic, commercial, and industrial origin. General waste as described above is divided into the following waste types for STLM Area, namely:

- General: Municipal waste
- General: Construction and demolition waste
- General: Organic waste
- General: Bottom ash
- General: Commercial and industrial waste

7.2. Sources of waste

Main Waste Sources and Sectors



- **Residential Areas:** Households generate everyday domestic and general municipal solid waste collected through scheduled municipal refuse removal.
- **Commercial and Retail Shops:** Businesses, shopping centers, and offices drop off general commercial waste and packaging materials.
- **Industrial and Manufacturing Plants:** Non-hazardous industrial waste streams delivered directly by factories or authorized industrial contractors.
- **Construction and Demolition Sector:** Builder's rubble and excavation debris originating from building, renovation, and demolition sites.
- **Garden and Landscaping Services:** Green waste and organic refuse hauled by private garden removal companies or residents.
- **Municipal Operations:** Street cleaning debris, public space upkeep, and collected trash from local street-sweeping services.

7.3. Volumes of waste

Quantification of General Waste collected at Steve Tshwete Local Municipality was based on the monthly datasets that were sourced from the Middelburg Landfill Site Weigh Bridge data report. This contains monthly waste quantities over a period of 3 years. STLM currently operates 1 permitted landfill site, which is the Middelburg Rietfontein 286 JS Landfill site. The landfill site was expanded in 2017 with licence no. 17/04/WL/MP313/12/01 due to the limitation of the airspace capacity of the current cells.

The landfill site utilises a dual weighbridge system facility to record waste quantities entering and exiting the site. STLM logs waste entering the landfill site into different categories, which is illustrated in **Table 19** below. The STLM determines the quantities and the types of waste generated in its area of jurisdiction. This involves establishing the current quantities of waste generated, recycled, treated and disposed of. Waste management information is needed for:

- Ensuring adequate planning of resources to deliver waste management services;
- Rolling out of waste collection services to the unserved areas as prioritized by government;
- Establishing waste recycling initiatives, i.e., buy-back centers which can have positive impacts in the reduction of the number of recyclables going to landfill, and the establishment of SMME's in waste management which can promote entrepreneurship amongst residents;
- Provision of a certain number of waste receptacles and the establishment of collection needs i.e., how many skips should be provided in communal areas such as shopping



centers, clinics and other public areas such as sport clubs; and for implementing separation at source initiatives,

- Ensuring that the Municipality procures the correct types of vehicles as well as budgets for the correct number of vehicles that will be required to effectively deliver the service; and
- Making projections of future waste quantities in order to ensure that provision is made for future waste services delivery and the expansion of infrastructure to deliver the service, i.e., the information will highlight if there is a need to establish new waste disposal facilities, waste transfer stations for faster and more effective collection rates.

The weighbridge information used is obtained from the Municipality's landfill statistics for waste disposed of for the past three financial years

Table 1a: Waste Volumes/Quantities

Waste type	Quantities (tonnes)	
	Year 2024	Year 2025
Municipal waste	103028.34	93445.59
Organic waste	5579.41	10491.32
Ash	1336.94	1887.26
Construction & demolition waste	13857.6	2150.72
Commercial waste	1379.78	6263.78
Total	125182.07	114238.67

Table1b: Recyclable Materials Volumes

Waste type	Quantities (tonnes)
	Year 2025/26
Recyclables	1 621,83

7.4. Waste Characterization

The waste characterisation information was obtained from the STLM IWMP, conducted in 2023. The aim of the study was to analyse and categorise the waste that comes into landfill for disposal. The following methodology was followed:



- Recorded the loads that came in, the type of vehicle and waste generation sector.
- Analysed the types of waste each vehicle carried.
- Categorised waste generation sectors
- Categorised the waste and estimated the percentage of the categories.

Table 2: Waste profile and estimated percentages

Waste type	Estimated Percentage (%)
Plastic	34
Glass	4
Card box	10
Clothing	3
Ash	6
Paper	3
Food	10
Garden	12
E-waste	2
Metal	2
Construction waste	10
Other (wrappers, chips packets, foil, cling wrap, sand, stone).	2
Total	100

The result of the waste characterisation shows that most waste being disposed at the landfill is municipal waste, followed by uncategorised business and industrial waste generation sector.

The following were also noted from the results of the waste characterisation in **Table 2**:

- 53% of the waste stream by estimation is composed of mainstream recyclables (paper, plastic, cardboard, glass, and metal);
- 22% of the waste stream by estimation, is organics. The bulk of the organics is garden waste; and
- The remaining 25% of the waste is comprised of clothing, other general waste .

Record Keeping and Reporting



All records relating to the management of wastes are handled by STLM. All activities undertaken must be recorded. As a minimum, the following records are kept:

- A comprehensive Waste register showing the quantities of waste disposed on site;
- Material Safety Data Sheets (MSDS) for all hazardous chemicals;
- Permits related to the management of wastes;
- Records of communication with internal and external stakeholders regarding management of wastes;
- Records of training related to the management of wastes;
- Complaints and incidents;
- Records of audits and inspections related to the management of wastes; and
- Copies of communication with contractors related to the requirements of this plan

8. Waste Impact Analysis

8.1. Site Sensitivity

Conservation of the vegetation type within which the landfill falls is classified as endangered with a target of 24%. Poorly conserved (only 1%). Small patches protected in statutory reserves (Kwaggavoeetpad, Van Riebeeck Park, Bronkhorstspuit, Loskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half has been transformed mostly by cultivation, plantations, urbanization or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit (D.B. Hoare, personal observation). Scattered aliens (most prominently *Acacia mearnsii*) occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

In terms of the Mpumalanga Biodiversity Sector Plan (2014), the assessed site falls within the Critical Biodiversity Area (CBA): Wetlands, Mpumalanga Highveld Wetlands and Ecological Support Area (ESA): Important Sub-catchments. The site is indicated to be within a natural wetland. Based on the state of the natural vegetation cover of the wetland and the associated ecological value of the habitat, the ecological sensitivity of the study area is regarded as very high, as illustrated in Figure 4.

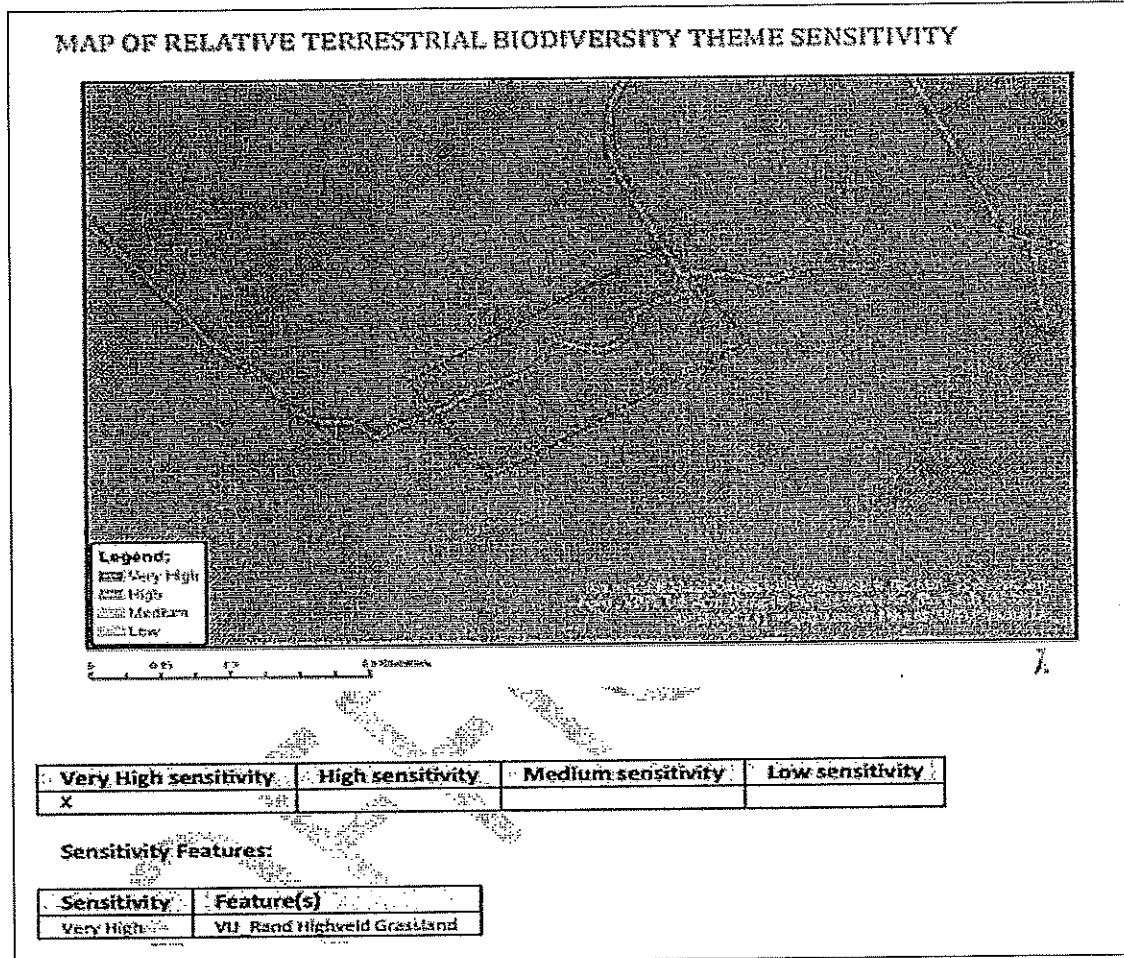


Figure 4: Sensitivity map

8.2. Identified Impacts

8.2.1. Air Pollution and Climate Change

- Impacts to air quality will occur as a result of maintenance activities and deposition of general waste at the landfill facility.
- Where maintenance activities are undertaken in conjunction with exposed soils, there is a risk of generating dust.
- Vehicles also utilize hydrocarbon fuels and are known to have greenhouse gas exhaust fumes. During the operational and closure phases, the surface of the landfill facility will be increased substantially. This area will be exposed to the elements.
- Additional impacts may occur from windblown particles from the exposed areas of landfill.
- Methane gas production: Organic waste breaks down without oxygen and creates methane, a gas that traps heat in the atmosphere much faster than carbon dioxide.



- Spontaneous fires: Underground fires can start on their own inside waste piles, releasing dangerous dioxins into the air.
- Bad smells and toxic air: Piles of trash release volatile organic compounds and bad odors that hurt nearby air quality.

8.2.2. Groundwater Pollution

- Leachate creation: Rainwater moves through trash and forms a toxic liquid called leachate.
- Groundwater damage: Leachate can leak into local water sources and underground aquifers, carrying heavy metals and chemicals.

8.2.3. Surface water Pollution

The consecutive rehabilitation (capping and replacement of soils on the landfill body and side slopes), maintenance vehicles traversing the sites, and potential leaks/spills along pipelines could all result in impacts to the surface water environment.

These activities could result in the following impacts to surface water/wetland resources:

- Decrease in water quality:
 - Remotely possible hydrocarbon spillage that may enter the water courses;
 - Increased sedimentation / suspended solids in water resulting in increased turbidity;
 - Increased, albeit limited, possibility of creating an environment for micro-organisms such as E.coli to proliferate; and
 - Decreased habitat conditions;
- Decrease in water quantity:
 - Surface water flow that is intercepted by the dirty water containment infrastructure will decrease the volume of runoff entering surface water resources.

8.2.4. Land Use and Biodiversity Disruption

- The primary impact to the terrestrial ecology will occur as a result of consecutive rehabilitation. Consecutive rehabilitation involves the placement of soils on the developed slopes of the landfill facility, and then re-vegetation with a suitable seed mix of indigenous pioneer species. The effect of these activities will be the systematic recovery of the vegetation within the development footprint.



- **Habitat loss:** Landfills take up large pieces of land, destroying natural homes for plants and animals.
- **Pests and scavengers:** Open or poorly managed sites attract large groups of rodents and scavenger birds that eat harmful trash materials.
- **Landfills alter the fauna:** Landfill sites have particularly negative effects on bird migration. Some birds feed from landfill sites, inevitably ingesting plastic, aluminium, and other materials that are common among waste, which can even prove fatal.
- **Introduction of alien invasive plants.**

8.2.5. Soil Contamination

- The activities that will impact on soils will primarily be the consecutive rehabilitation of the landfill facility and side slopes (capping of the facility/waste compaction will involve the handling and placement of soils),
- Vehicles traversing the site, and leachate generated from the landfill body: Toxic leaks change the natural makeup of the soil, making it unsafe for plants and local wildlife.

8.2.6. Social Environment

- The activities that will have an impact on the social environment include the maintenance of the landfill for use by the local public.
- **Landfills reduce the value of the surrounding areas:** The bad smells that emanate from landfill sites cannot be effectively controlled and, almost inevitably, reach nearby populations. Property prices are reduced in areas located near to these waste stores, which further perpetuates the devaluation of disadvantaged areas.
- Accidents sometimes occur in landfill sites: landfills may collapse and cause deaths of workers and people in nearby areas, and reclaimers may be hit by moving vehicles
- Socio-economically, landfill sites also have positive impacts.
 - The retention of jobs at the landfill site;
 - Potential for recycling by informal scrap collectors;
 - Provision of the landfill site for use by local residents, thereby reducing the likelihood that waste will be buried or burnt.

8.3. Impacts and Risk Assessment

8.3.1. Risk Rating Criteria



Likelihood or Frequency (L): How often can the event be expected to happen?

Likelihood Class	Factor (L)
Definite	10
Possible	6
probable	3
Unlikely	1

Extent (E): How much area can the event affect?

Extent	Factor (E)
Immediate area	1
Project area	3
Local	6
Regional	10

Severity (S): What is the outcome of the event should it occur?

Severity	Factor (S)
Low	1
Moderate	3
High	5

Significant Impact

IMPACT SIGNIFICANCE	
0-30	LOW
31-60	MEDIUM
61-100	HIGH

Mitigation Measures

No effective mitigation	1
Written procedure	2
Training Complete	3
Monitoring and measurement conducted	4
Preventative measures	5



Engineering methods/control	6
Project completed to remove/reduce risk substantially	10

8.3.2. Risk Rating Calculation

Raw Risk=L (Likelihood) X E (Extent) X S (Severity)

Residual Risk= Raw Risk / Mitigation

8.3.3. Risk Rating Matrix

Table 3: Impact assessment rating

Activity	Aspect Description	Impact	Project Phase	Likelihood	Extent	Severity	Raw Risk	Mitigation/ Control Measure(s)	Mitigation Rating	Residual Risk	Impact Significance
Waste disposal/ Landfilling	Groundwater	Water pollution from seepage of leachate water from the old working cell	Operational	6	6	3		Waste diversion and minimization to lower the amount of leachate generation	5	21,6	
Waste disposal/ Landfilling	Surface water	Water pollution from leachate runoff from the site to the nearby stream	Operational	6	3	3	54	Construct a leachate drainage system for the old cell	6	9	Low
		Water pollution from stormwater runoff from site to nearby stream	Operational	10	6	3		Construct a stormwater management system for the old cell	6	30	Low
Waste handling, storage and disposal	Disposal of hazardous waste	Contamination of the area with potential surface and ground water	Operational	3	1	3	9	Ensure spotters are always available during waste offloading	4	2.3	Low
Waste handling, storage and disposal	Incorrect handling of waste (littering)	Land pollution	Operational And Closure	6	3	3	54	Proper and effective waste compaction	5	10.8	Low
Waste disposal/ Landfilling	Accidental fires and explosions	Air pollution	Operational	6	3	3	54	Control oxygen flow by compacting waste tightly and restrict hot or	2	27	Low



Transportation of material and operation of machinery	Greenhouse gas emissions	Air pollution				10	3	3		hazardous items like batteries and chemicals	5	18	Low
	Soil erosion on the slopes of the cell	Loss of soil				6	1	1		Vegetate the slopes	5	1.2	Low
	Exhaust emissions from vehicles and machinery	Air pollution				10	3	1	30	No effective mitigation	1	30	Low
	Spillages/leakages of hydrocarbons	Soil, ground and surface water pollution				3	1	3	19	Regular maintenance of vehicles and machinery	6	1.5	Low
	Dust generation	Air pollution				10	3	3		Regular dust suppression	5	18	Low
	Introduction of invasive alien plants	Biodiversity disruption and water security threat				6	3	3	54	Develop and implement an invasive alien plants management plan	2	27	
	On-site maintenance of machinery	Spillages/leakages of hydrocarbons				6	1	6	36	Use of drip trays during On-site maintenance of machinery	5	7.2	Low
	Site rehabilitation and plants revegetation	Loss of soil				6	3	6		Regular monitoring	4	27	Low

9. MITIGATION AND MANAGEMENT PLAN

9.1. Operational Phase

Ground Water

- Ensure that the mitigation measures documented in the risk rating matrix are implemented, especially the installation of a suitably designed barrier system below the facility.
- Stormwater management plan must minimize the influx of clean water into dirty water containment areas.
- Ground water testing from boreholes must be conducted as per license conditions.

Surface Water

- The surface water and groundwater monitoring plan must identify any traces of impact to water resources, and these must be investigated timeously by a water specialist;
- All waste generated through maintenance activities is to be managed in line with the Environmental Management Plan;
- Fence off “no-go” areas to ensure these areas are not impacted on by maintenance activities; install a DWA-approved barrier system at the new landfill facility to prevent contamination of the water bodies;
- Ensure that soils placed during consecutive rehabilitation/waste compaction of the landfill body and side slopes of the facility are ameliorated with a suitable mix of additives (fertilizers, lime etc.) and that an indigenous seed mix is used for seeding of the slopes;
- Develop and implement an alien invasive programme/plan to effectively control alien invasive plants.
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas.

Air Quality

- Regularly undertake dust suppression on all gravel roads using uncontaminated water to ensure that dust generation is prevented.
- Waste diversion and minimization:



- Compact waste tightly: Pack down trash with heavy machinery so that trapped air cannot feed underground flames.
- Apply daily soil cover: Cover fresh layers of trash with dirt or sand at the end of each day to block oxygen.
- Prohibit dangerous items: Ban hot ashes, vehicle batteries, electronic waste, and reactive chemicals from entering the site.
- Maintain firebreaks: Clear surrounding perimeter zones of dry brush, weeds, and loose debris.

Biodiversity

- Undertake consecutive rehabilitation to ensure that a sustainable vegetation cover is achieved on the slopes;
- Ensure that newly placed soils and seeded areas (if available) are watered for the first 2 years on a regular basis to improve the success of re-vegetation activities;
- A suitable seed mix of indigenous plants should be used in all rehabilitation program on the site;
- All alien invasive species on-site should be removed, and follow-up monitoring and removal program should be undertaken throughout the operational phase of the project;

Soils and Land Capability

- Ensure that a suitably designed barrier system is installed with a leachate collection and leak detection layer included;
- Ensure that suitably designed stormwater management infrastructure is installed/constructed and maintained for the duration of the operational phase, especially around the working cells.
- Ensure that soils which are stockpiled for more than 1 year (if any) are suitably fertilized and vegetated to reduce the risk of erosion;
- Ensure that soils to be placed on the landfill during capping/compaction and consecutive rehabilitation of the facility and side slopes are suitably ameliorated with a lime and fertilizer mixture. Soil fertility tests should be undertaken prior to placement to determine what additives need to be made to the soil to enhance its fertility;
- The facility is to be compacted with a soil layer covering of at least 300 mm to ensure that a sustainable compaction and vegetation layer on the slopes can be established post-



closure. This must be monitored and reported on by an independent soil scientist on an annual basis until the rehabilitation of the facility is completed;

- No grazing is to be permitted on the facility. Fences will be regularly maintained;
- Access roads should be tarred or paved and vehicles maintained regularly. Vehicle access should be restricted to demarcated routes and parking areas

Social Environment

- Dust suppression must be used to prevent nuisance and health impacts to nearby residents, reclaimers and employees.
- Grievances and complaints must be dealt with within a certain period and must be recorded in a register stating the grievance/complain, date that it occurred and action taken.
- No open fires must be allowed.

10. EDUCATION AND AWARENESS

Steve Tshwete Local Municipality ensures that its residents, employees and contractors are aware of the importance of minimizing impacts related to waste and specific mitigation measures aimed at achieving this. This is achieved by developing and implementing environmental awareness and clean-up campaigns.

11. MONITORING AND MAINTENANCE

11.1. Operational phase

- Regular site inspections and monitoring.
- Regular maintenance of site equipment, machinery, stormwater management system and leachate drainage system.
- Conduct water monitoring as per the license conditions.
- Monitor the implementation of management plans: Environmental Management Plan, Invasive Alien Plants Management Plan, Operational Plan, etc.

11.2. Post Closure

- Inspection of soil surfaces before replacing soil to ensure that contouring is appropriate and has been done properly; topography is emulated;
- Random inspection of soil thickness on rehabilitated sections;



- Erosion monitoring of rehabilitated areas should be undertaken and zones with active erosion should be identified, and
- Evaluating and readjusting the rehabilitation plan

12. CONCLUSION AND RECOMMENDATIONS

The impacts associated with the landfill site are primarily linked to surface and groundwater pollution, air quality pollution, climate change, biodiversity disruption, soil contamination and socioeconomic issues. Without mitigation, these impacts may contribute to localised habitat loss, reduced vegetation in the surrounding areas, health impacts due to pollution and water contamination. However, provided that all operational activities are strictly confined to the authorised footprint, sensitive ecological features are avoided where feasible, and the recommended mitigation and rehabilitation measures are effectively implemented, the significance of the identified impacts can be reduced from high and moderate to low.

It is recommended that the following:

- All provided mitigation measures be considered to ensure minimal impact on the environment.
- An alien invasive management plan must be available before the commencement of the rehabilitation and operational phases.
- Continued waste diversion: Enforce strict organic waste bans or diversion programs to cut biodegradable waste and continue education and awareness on organic waste composting.
- Maintain native vegetation barriers and regular groundwater monitoring boreholes around the site perimeter.
- Look into investing in methane capture for energy conversion.
- Investigate and research effective and cost-effective leachate water treatment to reuse it for dust suppression.

Based on the findings of the waste impact assessment undertaken for the landfill site within the STLM, the operational site is considered ecologically acceptable, provided that all recommended avoidance, mitigation, rehabilitation and monitoring measures contained in this report are fully implemented and maintained throughout the operational and rehabilitation phases. The identified impacts are expected to remain localized and largely confined to the authorized project footprint,



particularly where sensitive areas such as wetlands are avoided, where disturbance is unavoidable, the disturbance is minimized, and alien invasive plant species are actively managed. With effective implementation of the prescribed mitigation measures and ongoing environmental management, the significance of the identified impacts is expected to be reduced to a low rating.

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