

**ENVIRONMENTAL ASSESSMENT REPORT
FOR THE PROPOSED SOLID WASTE
DISPOSAL FACILITY (LANDFILL) AT
OKANDJIRA SETTLEMENT, OTJOZONDJUPA
REGION, NAMIBIA**

March 2026

Prepared on behalf of:

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PROJECT NAME	ENVIRONMENTAL SCOPING REPORT FOR THE PROPOSED SOLID WASTE DISPOSAL FACILITY (LANDFILL) AT OKANDJIRA SETTLEMENT, OTJOZONDJUPA REGION, NAMIBIA
STAGE OF REPORT	Final Report
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LIST OF ACRONYMS

Acronym	Meaning
BID	Background Information Document
cc	Close Corporation
D2102	District Road 2102
DEA	Department of Environmental Affairs
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GN	Government Notice
I&APs	Interested and Affected Parties
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MICT	Ministry of Information and Communication Technology
NDC	Nationally Determined Contribution
NDPs	National Development Plans
NHC	National Heritage Council
NSA	Namibia Statistics Agency
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SMMEs	Small, Medium and Micro Enterprises
km	Kilometre
m	Metre
mm	Millimetre
m/s	Metres per second

EXECUTIVE SUMMARY

The Otjozondjupa Regional Council proposes the development of the Okandjira Landfill to provide an environmentally compliant and sustainable waste management facility for the settlement and surrounding areas. This Environmental Impact Assessment (EIA) was undertaken in accordance with the Environmental Management Act (7 of 2007), and Regulations (2012) to evaluate the potential environmental and socio-economic impacts associated with the planning, construction, operational, and closure phases of the project.

A comprehensive public consultation process was conducted in line with regulatory requirements. Key concerns raised included potential groundwater contamination, public health and waste reuse and recycling operational management capacity, and long-term site rehabilitation. All comments were documented and incorporated into the assessment.

The impact assessment identified groundwater contamination from leachate as the most significant potential risk. However, with installation of a properly engineered composite liner system, leachate collection and management infrastructure, stormwater controls, this risk can be reduced to low significance. Construction impacts such as dust, noise, vegetation clearance, and traffic risks are temporary and manageable through standard mitigation measures. Operational risks relating to landfill gas, odour, pests, fire hazards, can be effectively managed through monitoring, and strict implementation of an Environmental Management Plan (EMP).

The assessment concludes that no fatal flaws were identified. Subject to strict compliance with the EMP, adequate institutional capacity, ongoing monitoring, and implementation of public health and safety measures. The proposed Okandjira Landfill is considered environmentally viable, and it is recommended that the Environmental Clearance Certificate (ECC) be granted, subject to enforceable conditions to ensure long-term environmental protection and sustainable waste management.

1. INTRODUCTION

1.1. Background

Solid waste management remains a significant environmental and public health challenge in many rural and peri-urban settlements in Namibia, where formal waste disposal infrastructure is limited or absent. In such areas, waste is commonly disposed of through uncontrolled dumping and open burning, practices that contribute to land degradation, air and water pollution, public health risks, and negative impacts on livestock and natural ecosystems.

Okandjira Settlement, located within the Omatako Constituency of the Otjozondjupa Region, has experienced gradual population growth and associated increases in waste generation. Existing informal waste disposal practices are no longer adequate to manage current waste volumes and pose increasing environmental and health risks to the local community and surrounding communal land.

In 2021, members of the Okandjira community formally raised concerns regarding solid waste disposal with the Omatako Constituency Councillor. In response, the Otjozondjupa Regional Council initiated steps to establish a formal waste disposal facility to address these challenges. The Kambazembi Royal Traditional Authority subsequently allocated 1.8 hectares of communal land for the development (**Annexure A**).

The proposed landfill is intended to replace uncontrolled dumping and open burning practices with a regulated, environmentally compliant waste disposal system. The development forms part of the Regional Council's broader mandate to improve environmental health conditions, protect natural resources, and ensure sustainable service delivery within the region.

1.2. Scope of the Environmental Impact Assessment

This Environmental Impact Assessment (EIA) has been undertaken to identify, assess, and evaluate the potential environmental, social, and economic impacts associated with the establishment and operation of the proposed landfill at Okandjira Settlement.

The scope of the assessment covers the full life cycle of the project, including the planning, construction, operational, and proposals of post-closure rehabilitation phases. Key aspects assessed include, but are not limited to:

- Impacts on soil, surface water, and groundwater resources;
- Vegetation clearance and impacts on communal land use and grazing;
- Public health and safety risks;
- Socio-economic implications for surrounding communities; and
- Cumulative and long-term environmental risks.

The findings of the assessment are supported by an Environmental Management Plan (EMP), which outlines mitigation, monitoring, and management measures to ensure that potential impacts are avoided, minimised, or effectively managed.

1.3. **Proponent**

The project proponent is the Otjozondjupa Regional Council, a statutory body mandated to provide governance, infrastructure development, and service delivery at the regional level in terms of the Regional Council Act, 22 of 1992, as amended. This mandate includes responsibility for the planning and implementation of waste management services within settlements under its jurisdiction as set out in the National Waste Management Strategy.

The proposed landfill aligns with the Regional Council's objectives to improve waste management practices, enhance environmental protection, and ensure compliance with national environmental legislation and policy requirements.

1.4. **Environmental Assessment Practitioner (EAP)**

Envirofficient Consultants cc was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment and to prepare the Environmental Management Plan (EMP) for the proposed facility (CV of lead consultant is attached as **Annexure B**).

The EAP undertook the study with due professional care, objectivity, and independence. Envirofficient Consultants cc has no financial or other vested interest in the proposed development, apart from its role as an independent environmental consultant.

1.5. **Regulatory Framework and Need for Environmental Assessment**

The assessment was conducted in accordance with the Environmental Management Act, 2007 (Act No. 7 of 2007), and the Impact Assessment Regulations of 2012, which listed activities that may not be undertaken without an Environmental Impact

Assessment (EIA) and the issuance of an Environmental Clearance Certificate (ECC) by the Ministry of Environment, Forestry and Tourism (MEFT).

The proposed Okandjira landfill triggers the following listed activities in terms of the EIA Regulations:

- **Activity 2.1:** Construction of facilities for waste sites, the treatment of waste, and the disposal of waste;
- **Activity 4:** Clearance of forested areas or vegetation requiring authorisation under the Forest Act (Act No. 12 of 2001).

Environmental Impact Assessment is legally required to evaluate the potential environmental, social, and economic impacts of the proposed development and to ensure that appropriate mitigation and management measures are implemented. This EIA provides basis upon which MEFT may consider the application for an Environmental Clearance Certificate for the proposed landfill at Okandjira Settlement.

2. PROJECT DESCRIPTION

2.1. Location and Site Description

Okandjira Settlement is situated approximately 42 km east of Okahandja, accessible via the D2102 district road. The proposed landfill site is located approximately 1.1 km west of the existing developed area of the settlement. The site falls just outside the proclaimed Okandjira settlement townland and is situated on communal land under the jurisdiction of the Kambazembi Royal Traditional Authority. The Traditional Authority has formally allocated approximately 1.8 hectares of land to the Otjozondjupa Regional Council for the proposed landfill development.

The project area currently includes a boundary wall enclosing approximately 1 hectare of the allocated land; however, the Environmental Impact Assessment (EIA) will be conducted for the full 1.8-hectare site. The area is presently being used as an informal dumping site, where open-fire burning of waste is practiced. The boundary wall is approximately 2 metres high, secured with razor wire, and remains locked at all times to restrict unauthorized access.

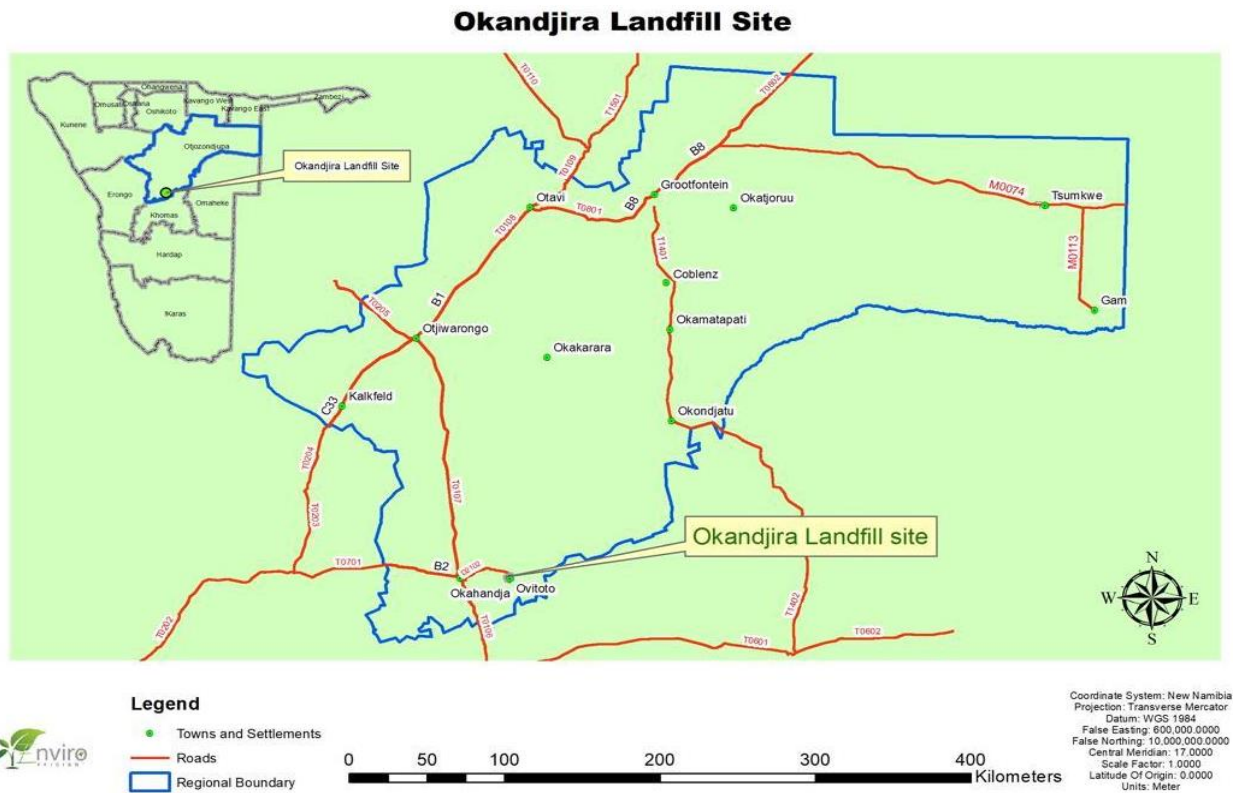


Figure 1 Landfill relative map.

Okandjira Landfill Site

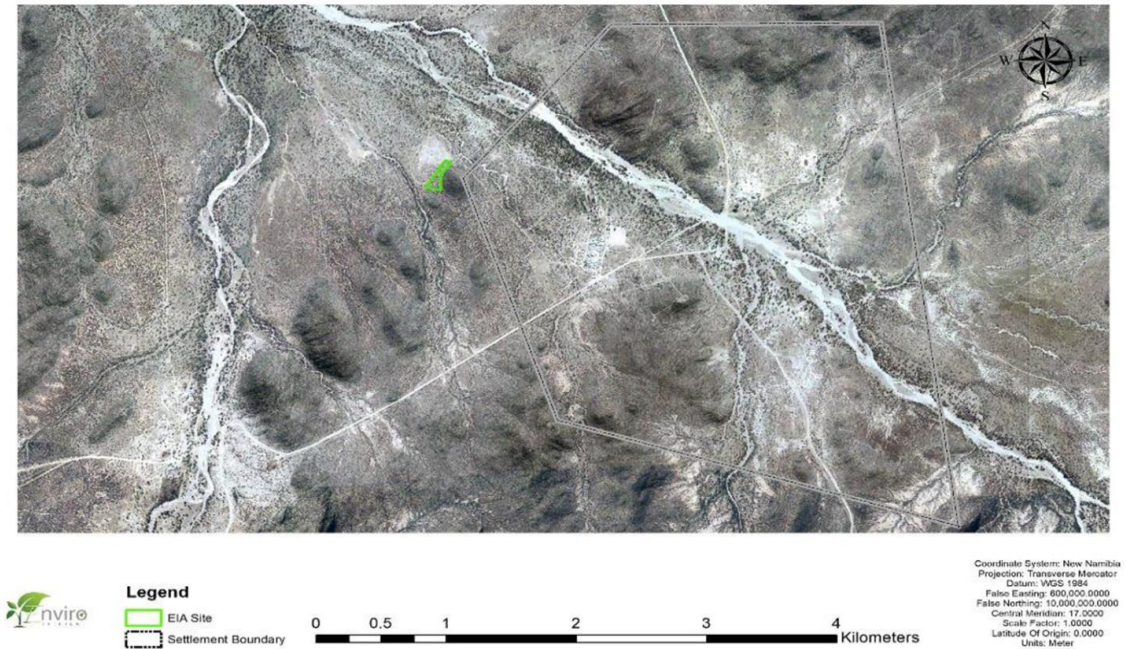


Figure 2 Locality map, depicting townland and site.

Okandjira Landfill Site

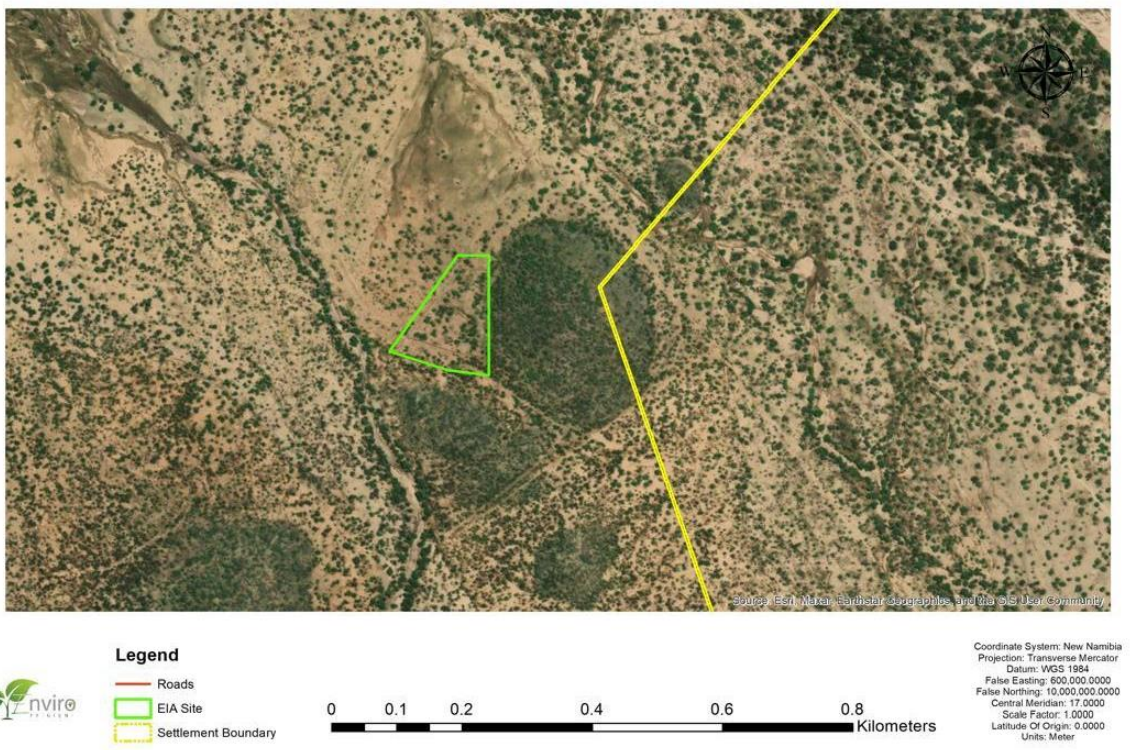


Figure 3 Site Plan Okandjira Landfill

Approximately 1 hectare of the allocated land has already been fenced and secured with a boundary wall by the Regional Council. However, the Environmental Impact Assessment (EIA) covers the full 1.8-hectare site to allow for comprehensive planning, adequate buffer provision, and future operational flexibility.

Surrounding land uses include communal grazing areas to the north and north-west, mountainous terrain to the east, and ephemeral drainage lines and tributaries to the south and west that drain towards the Von Bach Dam catchment. A horse racing field and scattered agricultural activities are located within the wider surrounding area.

No known proclaimed heritage sites occur within the footprint of the proposed development.

2.2. **Need for the Project**

Solid waste management in Okandjira Settlement is currently characterised by informal and unregulated disposal practices, which contribute to land degradation, air pollution, potential contamination of water resources, and risks to public health, livestock, and the natural environment.

Population growth and changing consumption patterns within the settlement have resulted in increasing waste volumes that can no longer be sustainably managed under existing practices. The absence of a formal waste disposal facility undermines compliance with national environmental legislation and limits the Regional Council's ability to provide effective waste management services.

The proposed landfill is therefore required to:

- Provide a controlled and designated disposal site for general solid waste;
- Reduce environmental pollution and public health risks;
- Support compliance with national waste management legislation and policy;
- Improve overall environmental conditions within Okandjira Settlement

2.3. **Suitability of the Proposed Site**

The selected site is considered suitable for a small-scale landfill based on its separation from residential areas, prevailing wind direction, accessibility via existing road infrastructure, and current land use. The location allows for the establishment of appropriate buffer zones between landfill operations and nearby sensitive receptors while remaining accessible for waste collection vehicles (Ministry of Environment, Forestry and Tourism, 2017).

Topographically, the site is generally flat to gently sloping, with natural surface drainage directing runoff away from the central operational area towards surrounding ephemeral drainage systems. Soils are predominantly sandy and well-drained, consistent with Kalahari Group sediments typical of the region (Geological Survey of Namibia, 2018).

Although ephemeral drainage lines occur within the wider area, no permanent surface water bodies are located within the immediate footprint of the proposed landfill. Hydrogeological sensitivity and drainage patterns have been considered as part of the Environmental Impact Assessment (EIA) to ensure that appropriate mitigation measures are incorporated into the design and operation of the facility.

2.4. **Description of the Proposed Landfill Facility**

The proposed development involves a small-scale, controlled landfill designed to receive general domestic and non-hazardous waste generated within Okandjira Settlement and nearby areas. The facility will not accept hazardous, medical, or industrial waste.

Key components of the proposed landfill include:

- A designated waste disposal area (active cell);
- Controlled access with fencing and a lockable entrance gate;
- Internal access routes for waste collection vehicles;
- Stormwater management measures to prevent erosion and uncontrolled runoff;
- Designated areas for waste placement, compaction, and cover material; and
- Operational areas for basic site management activities.

Waste will be deposited in a controlled manner and compacted in layers. Feasible waste will be covered periodically with soil or other suitable material to minimise odours, windblown litter, pest attraction, and fire risks. Decomposition of waste will occur naturally over time through biological processes typical of landfill environments.

The landfill will be developed incrementally to allow for effective management and to extend its operational lifespan.

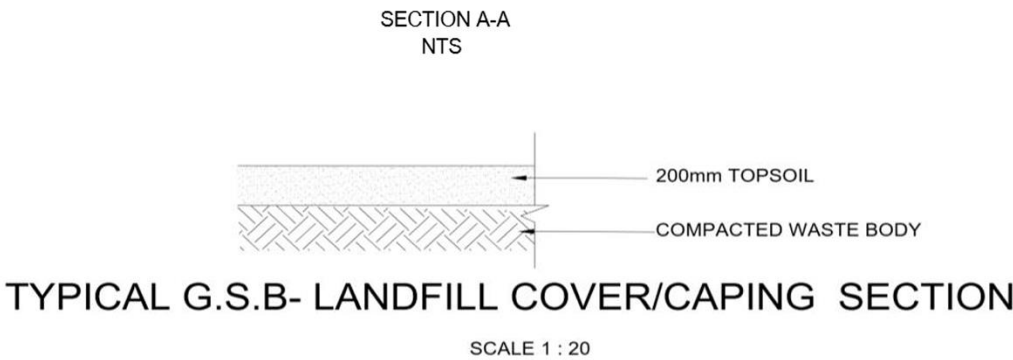
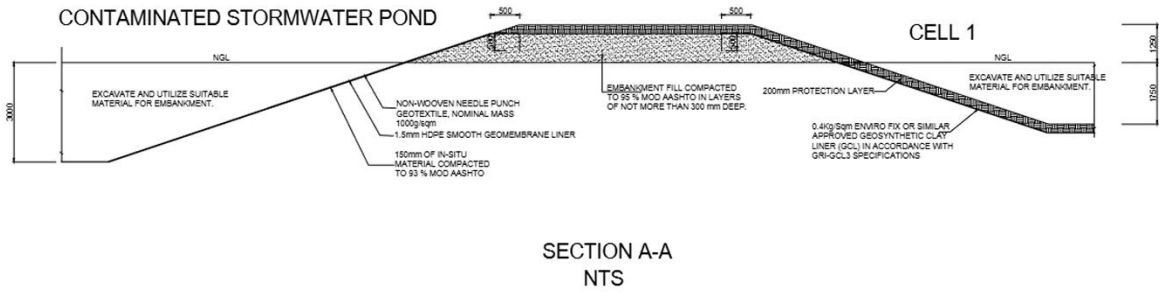


Figure 4 cross section design of Okandjira landfill (source Otjozondjupa Regional Council, 2026)

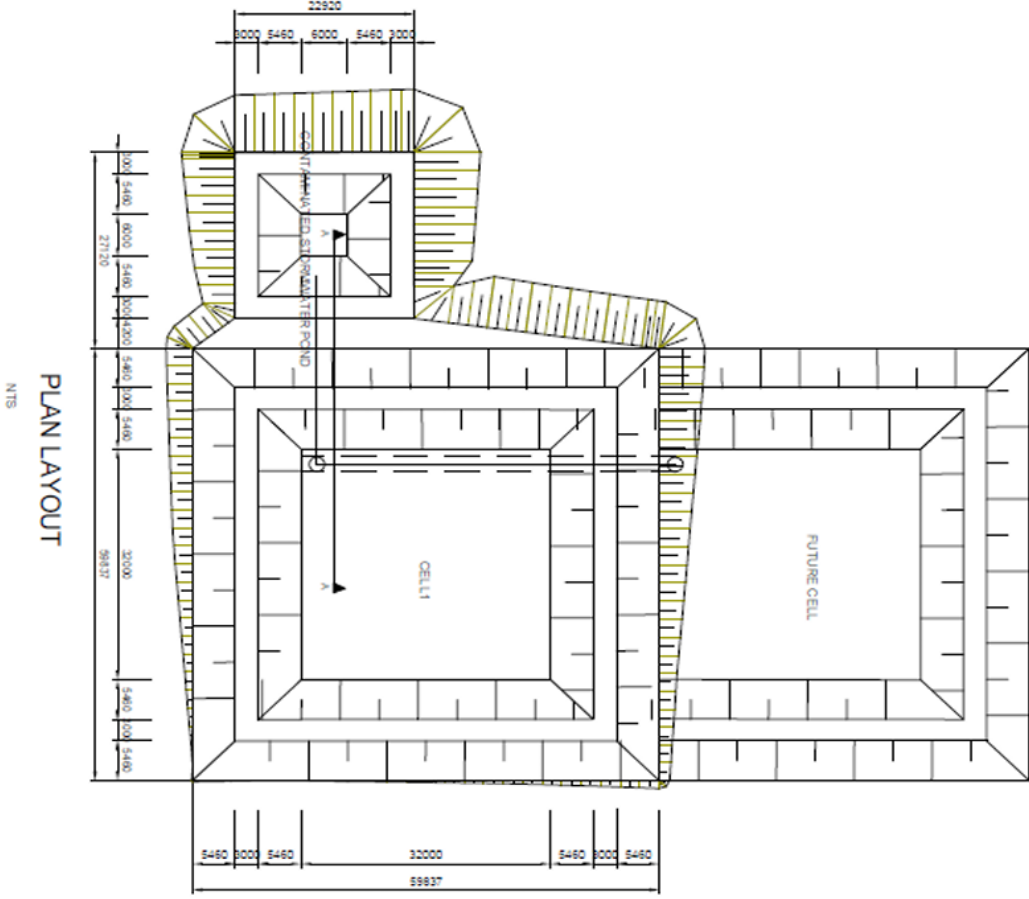


Figure 5 Proposes and future cell layout plan (source Otjozondjupa Regional Council, 2026)



Figure 6 current images of the landfill

2.5. **Waste Volumes, Scale, and Operational Approach**

At present, reliable quantitative data on waste generation rates and volumes at Okandjira Settlement is not available due to the absence of a formal waste collection system. Historically, waste disposal within the settlement has occurred through informal dumping and open burning practices, which preclude accurate measurement of waste quantities.

The proposed landfill is therefore planned as a small-scale facility, to be developed and operated incrementally. This approach allows waste volumes to be monitored once operations commence, enabling operational practices, cell development, and lifespan projections to be refined over time. Waste quantities and disposal rates will be recorded during operation and used to inform adaptive management measures through the Environmental Management Plan (EMP).

2.6. **Access and Services**

Access to the landfill will be provided via existing local road. No major new access roads are anticipated, although minor upgrades or routine maintenance may be required to accommodate waste collection vehicles safely. Basic services required for landfill operation include limited water supply for dust suppression and fire control, especially during the construction phase;

No permanent on-site accommodation is proposed, and operational staffing requirements are expected to be limited.

2.7. Consideration of Alternatives

Alternatives considered as part of the EIA include:

- **Alternative sites:** The selected site was preferred due to its suggestion by the traditional authority, distance from residential areas, accessibility, and land availability. Alternative locations closer to the settlement were considered less suitable due to proximity to sensitive receptors.
- **Design and operational alternatives:** Incremental development and controlled waste placement were preferred to reduce environmental risks and improve manageability.
- **No-go alternative:** The no-development option would result in the continuation of illegal dumping and open burning, with ongoing negative environmental and public health impacts, and was therefore considered undesirable.
- **Wind Direction:** The prevailing wind direction is predominantly from east to west at an average speed of approximately 3m/s (10 km/h). This is advantageous for the settlement occupied area, as it directs potential odour emissions away from the main settlement area, thereby minimizing nuisance impacts on occupied residential zones. The western side of the site comprises open land primarily used for grazing and communal access, which is less sensitive to such impacts, further supporting the suitability of the proposed landfill locality.

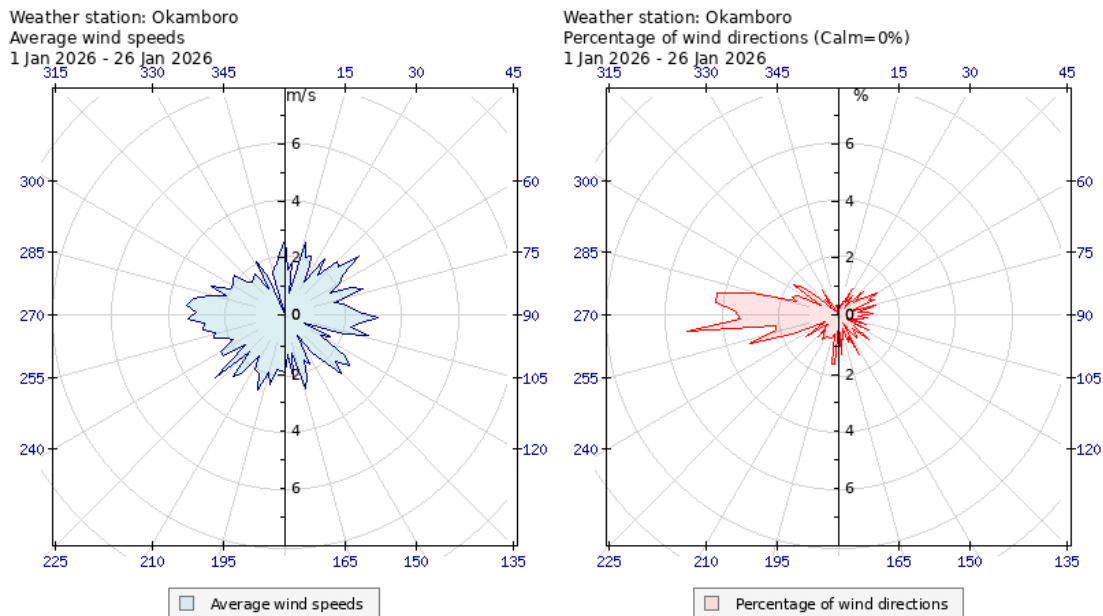


Figure 7 Average wind direction for January 2025 recorded at the nearest weather station Okamboro 25 km away from the project area. Source: sasscalweathernet.org

2.8. **Operational Management**

The Otjozondjupa Regional Council will retain overall responsibility for compliance, environmental performance, and reporting associated with the landfill facility. Day-to-day operation of the landfill will be undertaken by designated Regional Council personnel or an appointed service provider operating under the authority of the Council. Operational responsibilities will include access control, waste placement and compaction, nuisance control, record keeping, and implementation of mitigation measures outlined in the Environmental Management Plan (EMP).

3. LEGISLATION

The pursuit of sustainability is guided by a sound legislative framework. In this section relevant legal instruments as well as their relevant provisions have been surveyed. An explanation is provided regarding how these provisions apply to this project in particular.

Table 1 legal frameworks relating to the proposed project

THEME	LEGISLATIVE / POLICY INSTRUMENT	RELEVANT PROVISIONS	RELEVANCE TO OKANDJIRA LANDFILL PROJECT
Constitutional Framework	Namibian Constitution	Article 95(l): obligation to promote ecosystem integrity and sustainable use of natural resources for present and future generations.	Provides the overarching legal foundation for environmental protection, sustainable waste management, and safeguarding of groundwater, vegetation, and public health at Okandjira.
Environmental Assessment & Governance	Environmental Management Act 7 of 2007 (EMA)	Section 27: Listed activities require Environmental Clearance Certificate (ECC). Section 3: Environmental management principles including pollution prevention, waste minimization, and protection of water resources. Section 2(b-c): Public participation.	The proposed landfill is a listed activity and requires an ECC. The Act governs the entire EIA process, impact assessment, public consultation, and EMP implementation.
	Environmental Impact Assessment Regulations (GN 30 of 2012)	Sections 8, 15 & 21: Requirements for scoping, EIA reporting, public consultation, and consideration of alternatives.	Guides preparation of the Scoping/EIA Reports, public notices, public meetings, and issues-and-response trail for Okandjira.
Solid Waste Management	Pollution Control and Waste Management Bill	Provides for integrated waste management, licensing of disposal sites, prohibition of illegal dumping, and control of hazardous and general waste.	Provides policy direction and best practice guidance for landfill design, operation, closure, and waste handling at Okandjira, pending promulgation.
	National Solid Waste Management Strategy (2018-2028)	Promotes waste hierarchy (reduce, reuse, recycle), controlled landfill development, and protection of environmental and human health.	Aligns the Okandjira landfill with national objectives to replace uncontrolled dumping with engineered disposal facilities.
	Hazardous Substances Ordinance No. 14 of 1974	The Ordinance applies to the manufacture, sale, use, disposal and dumping of hazardous substances, as well as their import and export. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings.	Hydrocarbons handled during the construction phase may be hazardous thus careful handling and management is vital to prevent spills, explosions, ill-health or death.

Public Health & Safety	Public Health Act 36 of 1919	Section 119 prohibits nuisances injurious or dangerous to health, including refuse accumulation, odours, dust, pests, and contaminated water.	Requires the landfill to prevent odour, dust, vermin, and water contamination that could affect Okandjira residents and surrounding farms.
	Labour Act 11 of 2007	Sections 39-47: Working conditions; Section 135: Health and safety regulations.	Applies to landfill construction and operation workers, ensuring safe handling of waste, machinery, and hazardous materials.
	Health and Safety Regulations GN 156 of 1997	Occupational health standards, sanitation, exposure to harmful substances, and workplace safety.	Governs safety of landfill workers, including PPE use, sanitation facilities, and exposure to waste-related hazards.
Water Resources Protection	Water Act 54 of 1956 (still in force)	Section 21: Permit required for disposal of effluent. Section 23: Prohibits pollution of surface and groundwater; liability for remediation.	Highly relevant due to sandy soils, high permeability, and reliance on groundwater. Requires leachate control, stormwater management, and groundwater protection.
Climate & Air Quality	Atmospheric Pollution Prevention Ordinance 11 of 1976	Regulates dust, smoke, and noxious gases; Part IV addresses dust control.	Governs dust generation during construction, landfill operations, vehicle movements, and windblown litter under semi-arid, windy conditions.
Land Use & Tenure	Communal Land Reform Act 5 of 2002	Allocation and registration of land rights via Traditional Authorities and Communal Land Boards.	Legitimises the allocation of communal land donated by the Kambazembi Royal Traditional Authority for landfill development.
Local & Regional Governance	Local Authorities Act 23 of 1992	Empowers local authorities to provide waste management services, regulate refuse disposal, and promulgate by-laws.	Governs long-term operation, regulation, and enforcement of waste management services once Okandjira is under local authority administration.
	Regional Councils Act 22 of 1992	Mandates regional planning, infrastructure development, and service delivery oversight.	Provides institutional oversight by the Otjondjupa Regional Council for waste management planning and compliance.
Heritage & Archaeology	National Heritage Act 27 of 2004	Section 48: Permit required for disturbance or relocation of heritage resources; chance finds procedure.	Applies to potential graves or cultural sites associated with Ovaherero and Ovambanderu communities. Chance finds during construction must be reported and managed legally.
Vegetation & Biodiversity	Forest Act 12 of 2001	Protection of listed tree species; permits required for removal; Tree species and any vegetation within 100m from a watercourse may not be removed without a permit (S22(1)).	Relevant due to Thornbush Savanna vegetation and potential protected species within or adjacent to the landfill footprint. The clearing of vegetation is prohibited (subject to a permit) 100m either side of a river. Certain

			tree species occurring in the area are protected under this Act.
	Nature Conservation Ordinance 4 of 1975	Protection of indigenous flora and fauna.	Requires avoidance or mitigation of impacts on savanna-adapted species and pest attraction risks associated with waste disposal.
Traffic & Infrastructure	Roads Ordinance 17 of 1972	Road reserves, access controls, vehicle movement, and protection of proclaimed roads.	Governs access road use, increased landfill truck traffic, and protection of existing road infrastructure near Okandjira.
Development Planning	Vision 2030 & NDPs	Promote sustainable development, service delivery, and environmental protection.	Supports the landfill as basic service infrastructure improving environmental health and governance in a rural settlement context.
Disaster Risk Management & Emergency Response	Disaster Risk Management Act, 2012 (Act No. 10 of 2012)	Requires the identification, prevention, and mitigation of disaster risks, including fire, flooding, and other emergencies. Promote preparedness, response planning, and coordination between authorities.	Relevant due to potential landfill-related fire risks, extreme rainfall events, and emergency incidents. Requires the landfill to implement fire prevention measures, emergency response procedures, and coordination with local and regional disaster management structures.
Water Resources Protection (Future Framework)	Water Resources Management Act, 2013 (Act No. 11 of 2013)	Provides for sustainable management, protection, and control of water resources, including groundwater. Introduces water abstraction and discharge authorizations.	Although not fully operational, the Act is relevant for future groundwater protection and permitting. Aligns landfill design and operation with long-term national water resource protection objectives.
Climate Change & Resilience	National Climate Change Policy (2011) and Namibia's Nationally Determined Contribution (NDC)	Promotes climate resilience, adaptation to extreme weather events, and mitigation of greenhouse gas emissions. Recognizes waste management as a climate-relevant sector.	Relevant due to climate-related risks such as extreme rainfall, increased temperatures, landfill fires, and methane generation. Supports the incorporation of climate-resilient design and operational controls at the Okandjira landfill.
Environmental Health & Sanitation Governance	Environmental Health Regulations / Waste Management By-laws (where applicable)	Regulate sanitation, waste handling, nuisance control, and public health protection at settlement and local authority level.	Guides operational hygiene, nuisance prevention (odour, pests, litter), and public health protection. Applicable once local waste management by-laws or regional regulations are adopted or enforced.

Provisions that have emerged as being of particular significance, owing to the nature of the associated impacts, include those relating to water resources, vegetation, public health and traffic.

4. RECEIVING ENVIRONMENT

An assessment of the potential environmental and social impacts associated with the proposed Okandjira Settlement landfill requires a clear understanding of the existing conditions of the receiving environment. This section describes the baseline biophysical and socio-economic characteristics of the project area and its immediate surroundings. These baseline conditions provide the reference against which potential impacts arising from the construction, operation, closure, and rehabilitation phases of the landfill are identified, assessed, and managed.

4.1. Biophysical Environment

4.1.1. Climate

Okandjira Settlement is located within the semi-arid climatic zone of central Namibia, characterised by low and variable rainfall, high evaporation rates, and pronounced seasonal temperature variations. Rainfall occurs predominantly during the summer months between November and April and typically takes the form of short-duration, high-intensity thunderstorms (Mendelsohn et al., 2009).

Mean annual rainfall in the wider Omatako Constituency is estimated to range between 325 mm and 350 mm; however, significant inter-annual variability and periodic droughts are common (Strohbach et al., 2004). Summer temperatures frequently exceed 30 °C, while winter night-time temperatures may drop below 5 °C. Potential evaporation greatly exceeds annual rainfall, limiting surface water availability and increasing reliance on groundwater resources (Christelis & Struckmeier, 2011).

These climatic conditions are relevant to landfill development as they influence waste degradation rates, dust generation, odour dispersion, and stormwater management requirements.

4.1.2. Topography, Geology and Soils

Okandjira settlement in the Ovitoto area of the Otjozondjupa Region is situated on the central plateau of Namibia, characterized by gently swelling plains combined with low hills and occasional rocky outcrops. The area lies at an altitude of approximately 1,450–1,600 metres above sea level, and the terrain generally has gentle slopes ranging from 0–5%, which makes it suitable for rural settlement and livestock grazing (Mendelsohn, Jarvis, Roberts, & Robertson, 2002).

Ephemeral drainage lines, locally known as omiramba, traverse the area and carry water only during the rainy season, slightly influencing soil depth and vegetation patterns (Ministry of Environment and Tourism, 2011). Water run from the high ground of the mountain, through a tributary south of the landfill, into one of ephemeral rivers “Otjosazu” that feeds the Von Bach Dam in Okahandja.

Okandjira falls within the Damara Orogenic Belt, formed approximately 650-500 million years ago (Geological Survey of Namibia, 2015). Weathering of these parent rocks has shaped the soils of the area, which are predominantly sandy to sandy-loam, moderately shallow on upland areas, and deeper along drainage lines.

The soils are low in organic matter due to semi-arid climatic conditions, with Cambisols and Arenosols being the dominant types (Ministry of Agriculture, Water and Forestry, 2010). In low-lying drainage areas, more developed alluvial soils occur, offering slightly better agricultural potential, but overall soil fertility remains moderate to low, making the land more suited to livestock rather than intensive crop production.

4.1.3. Surface Water and Groundwater Resources

Surface water resources in the project area are limited and ephemeral. No permanent rivers or surface water bodies occur within the immediate footprint of the proposed landfill. Drainage occurs via ephemeral tributaries that convey runoff only during and shortly after rainfall events. These drainage systems form part of the broader Omatako catchment, which ultimately drains towards the Von Bach Dam downstream (MAWLR, 2020).

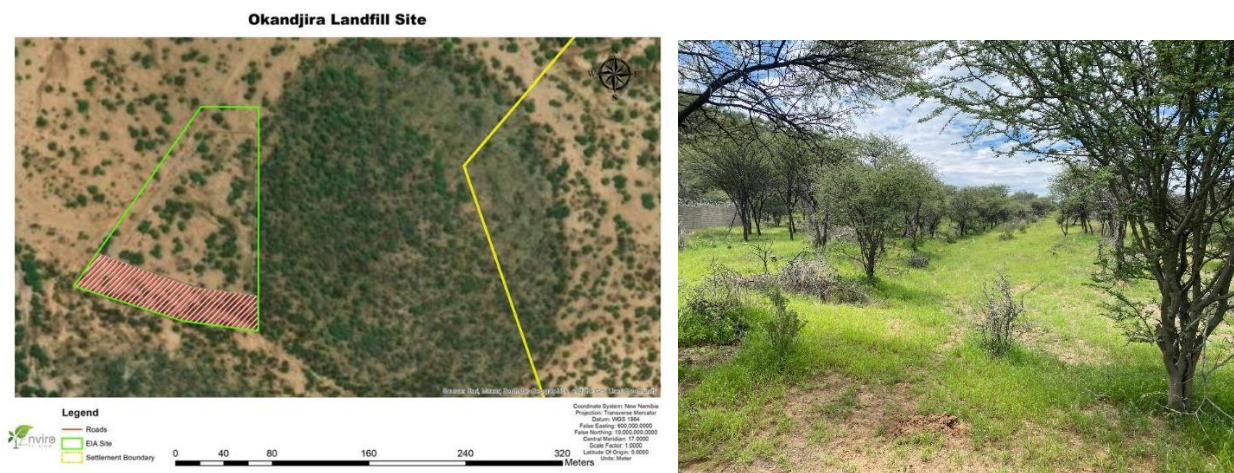


Figure 8 Drainage line on the western side of the site

The red-hatched area on the map includes an ephemeral drainage line originating from the higher slopes to the east, as illustrated in the image on the right. This drainage feature is environmentally sensitive and must be excluded from all development activities. In consideration of this constraint, the landfill boundaries shall be limited to the currently erected boundary wall and not extend outside as proposed to ensure that no encroachment occurs within the drainage line or its associated buffer area.

Groundwater represents the primary source of water for domestic, institutional, and livestock use in Okandjira Settlement and surrounding communal and commercial farming areas. Boreholes abstract groundwater from aquifers associated with Kalahari sediments and fractured basement geology, with groundwater levels often exceeding 50 m below ground surface (Christelis & Struckmeier, 2001).

Given the reliance on groundwater, the protection of groundwater quality is considered a critical environmental priority, requiring effective landfill design, leachate control, and long-term monitoring.

4.1.4. **Vegetation and Fauna**

The project area falls within the Savanna Biome, specifically the Thornbush Savanna vegetation type characteristic of the Otjozondjupa Region (Mendelsohn et al., 2002). Vegetation consists of open grassland interspersed with shrubs and scattered trees adapted to semi-arid conditions. Dominant woody species in the broader area typically include *Acacia* species and *Boscia albitrunca*. Grass cover is generally sparse and reflects historical grazing pressure and semi-arid climatic conditions.



Figure 9 Some of the flora found within the project area

Table 2 Identified trees by species in the study area

SPECIES	TOTAL NO. OF TREES COUNTED
<i>Boscia albitrunca</i>	5
<i>Dichrostachys cinerea</i>	3
<i>Acacia erioloba</i>	12
<i>Acacia karroo</i>	17
<i>kali tragus</i> (and other shrubs)	scattered around the site

Faunal species present are typical of semi-arid savanna environments and include common small to medium-sized mammals, reptiles, and birds adapted to human-modified landscapes. No threatened or endemic species were recorded within the immediate footprint of the proposed landfill site. However, poorly managed waste facilities may attract scavengers, rodents, and nuisance species, potentially creating secondary environmental and public health impacts.



Figure 10 some of the fauna spotted around the project area

4.2. Social Environment

4.2.1. Settlement Pattern and Services

Okandjira Settlement serves as the administrative centre of the Omatako Constituency within the Otjozondjupa Region. The settlement is predominantly rural in character, with dispersed residential areas and low population density. Basic services such as schools, clinic, and constituency offices are available locally, while higher-order services are accessed in nearby towns such as Windhoek, Okahandja and Otjiwarongo (Otjozondjupa Regional Council, 2023).

4.2.2. **Population and Livelihoods**

Otjozondjupa Region experienced substantial population growth between 2011 and 2023, increasing from 143,903 to 220,811 people, an overall rise of more than 53 percent over a 12-year period, an expansion in both urban centres and surrounding rural areas. In contrast, the population growth within Omatako Constituency has been comparatively modest, increasing from 17,288 in 2011 to 18,283 in 2023. Omatako Constituency represents a smaller proportion of the regional population, particularly when compared with rapidly growing constituencies such as Otjiwarongo and Okahandja (Namibia Statistics Agency, 2011; 2023).

This demographic pattern underscores the predominantly rural and agricultural character of Omatako Constituency and that of Okandjira Settlement, which has important implications for land use, service delivery, and community dynamics on service delivery and infrastructure, including waste management systems.

Livelihoods in the area are largely based on livestock farming, subsistence activities, public sector employment, pensions, and informal trading. Household income levels are generally low, with a high reliance on wages, social grants, and remittances (NSA, 2023).

4.2.3. **Land Use, Heritage and Sense of Place**

The landfill site is situated just outside the proclaimed settlement area, in communal land, administered by the Kambazembi Royal Traditional Authority.

The Otjozondjupa Region holds cultural significance for local communities, particularly the Ovaherero and Ovambanderu groups. No proclaimed heritage sites are known to occur within the immediate footprint of the proposed landfill (National Heritage Council of Namibia, 2018). Nevertheless, the possibility of unmarked graves or archaeological materials cannot be excluded. If they are by any chance encountered during construction or operation, they will be managed in accordance with the National Heritage Act (Act No. 27 of 2004).

4.2.4. **Traffic and Visual**

Traffic volumes in the Okandjira area are generally low and consist mainly of local, agricultural, and service-related vehicles. The operation of the landfill is expected to result in a minor but insignificant increase in traffic associated with waste collection.

The visual environment is characterised by open rural landscapes and low-density development. The landfill may introduce a localised visual impact, this impact is expected to remain limited due to the site’s distance from residential areas and the implementation of boundary walls and good housekeeping practices.

4.3. **Economic Environment**

Okandjira is the sole designated settlement within Omatako Constituency and serves as the administrative centre for local governance. There is limited infrastructure and formal economic activity beyond basic government services, small community facilities (clinic, school, police station), and few public institutions.

Local economic activities in Okandjira are small-scale and community-led, such as a communal organic garden project, which provides fresh produce for local consumption and some income from sales to nearby markets and lodges. This type of project reflects grassroots economic activity rather than formal commercial enterprise.

Efforts to stimulate economic activity include pilots such as biomass and renewable energy initiatives, intended to create temporary employment opportunities and develop small value chains in the settlement.

Large-scale economic ventures that were proposed such as the Ovitoto garment factory, have struggled to sustain operations, contributing little to local employment and economic growth.

Table 3 Main Sources of Income – Omatako Constituency (NSA,2023)

Main Source of Income / Livelihood	Percent of Population
Salaries and/or wages	57.8%
Old-age pension	10.4%
Farming	4.7%
Non-farming business activities	7.5%
Other/unspecified	19.6%

4.4. **Summary of Key Environmental and Social Sensitivities**

Key sensitivities associated with the receiving environment include the high permeability of sandy soils, reliance on groundwater resources for domestic and livestock use, proximity to communal land uses, and limited institutional capacity for waste management. These sensitivities have informed the design, operational approach, and mitigation measures proposed for the Okandjira Landfill.

Table 4 Summary of Key Environmental and Social Sensitivities

Feature	Description	Sensitivity	Potential Impact
Climate	Semi-arid climate with low and variable rainfall (approximately 325-350 mm/year); hot summers (often exceeding 30 °C) and cool winters (night-time temperatures occasionally below 5 °C); generally low to moderate wind speeds	Moderate sensitivity due to dry conditions and seasonal winds influencing dust generation, odour dispersion, and windblown litter	Increased dust and odour emissions during construction and operation; dispersion of litter by wind; accelerated waste decomposition during hot periods
Soils	Predominantly Ferralic Arenosols; sandy, highly permeable soils with low nutrient content and limited natural attenuation capacity	High sensitivity due to high permeability and low buffering capacity	Increased risk of leachate infiltration into subsurface soils; dust generation during site clearing, construction, and operation; potential long-term soil contamination if not properly managed
Groundwater	Moderate groundwater potential; boreholes generally deeper than 50 m; primary source of domestic and livestock water	Very high sensitivity due to reliance on groundwater and limited alternative water sources	Leachate infiltration leading to groundwater contamination; deterioration of potable water quality; potential impacts on human health and livestock
Surface Water	Ephemeral drainage lines present; no perennial rivers within the site; part of the Omatako catchment draining towards the Von Bach Dam	Moderate sensitivity despite the ephemeral nature of surface water, due to downstream connectivity	Contaminated runoff during heavy rainfall events; erosion or sedimentation of drainage channels; potential downstream water quality impacts
Vegetation	Thornbush savanna with scattered Acacia, and Boscia abitrunca species; areas	Low to moderate sensitivity; limited ecological uniqueness,	Localised vegetation clearance; habitat disturbance; potential damage to protected tree species if not identified and managed

	historically grazed and bush-encroached	although protected species may occur locally	
Fauna	Common savanna-adapted fauna; no known threatened or endemic species within the site	Low sensitivity	Disturbance to local fauna; attraction of scavengers, rodents, and nuisance species if waste is poorly managed
Topography and Drainage	Flat to gently undulating terrain with gradual slopes towards ephemeral drainage lines	Low to moderate sensitivity	Localised ponding, erosion, or off-site sediment transport if stormwater management measures are inadequate
Settlement Pattern	Rural settlement with dispersed homesteads; landfill located away from densely populated residential areas	Moderate social sensitivity	Nuisance impacts such as odour, dust, and litter; potential community dissatisfaction if operations are poorly managed
Livelihoods	Livestock farming, subsistence activities, public employment, pensions, and informal trading	Moderate sensitivity	Potential impacts on grazing areas or livestock health if contamination occurs; limited positive impacts through temporary employment opportunities
Heritage and Cultural Resources	No known proclaimed heritage sites; potential presence of unmarked graves	Low to moderate sensitivity	Disturbance of cultural or archaeological resources during construction if chance finds are not properly managed
Traffic and Access	Low existing traffic volumes; access via existing local roads	Low sensitivity	Minor increases in traffic volumes and road wear; increased safety risks if waste transport is not well managed
Visual Environment	Open rural landscape with low-density development	Low sensitivity	Localised visual intrusion and potential perception of environmental degradation without adequate site management

5. PUBLIC CONSULTATION

Public consultation is a fundamental component of the Environmental Assessment (EA) process and is intended to ensure that Interested and Affected Parties (I&APs) are informed and provided with an opportunity to comment on proposed developments that may affect them. In terms of the Environmental Impact Assessment Regulations (2012), public consultation is defined as a process through which potential I&APs are given an opportunity to comment on, or raise issues relevant to, a proposed activity (Regulation 1).

The public consultation process for the proposed Okandjira Settlement Landfill was conducted in accordance with Section 21 of the EIA Regulations (2012). The process was designed to promote transparency, inclusivity, and meaningful engagement, and to ensure that stakeholder concerns and expectations were identified and considered during the environmental assessment.

5.1. Stakeholder Identification

A comprehensive stakeholder identification process was undertaken to ensure that all relevant I&APs were included. A stakeholder register was compiled and maintained throughout the EA process and is provided in **Annexure C**. Identified stakeholders included:

- National Government Ministries,
- Traditional Authority, Regional and Local Authorities,
- State-Owned Enterprises and Utilities,
- Local Community Representatives,
- Private Sector Stakeholders, including local businesses and potential investors operating in or near the project area.

5.2. Stakeholder Notification

Formal notification of the proposed development was issued to all identified stakeholders. Email invitations containing a project description and details of the public consultation process were distributed to relevant institutions on 7 January 2026, inviting written comments and participation in the consultation process.

5.3. Public Notices

To ensure broad public awareness and compliance with regulatory requirements, public notices were placed in national newspapers with wide circulation, as follows:

- New Era newspaper on 7 and 14 January 2026; and
- Windhoek Observer newspaper on 7, 8, 14, and 15 January 2026.

These notices provided a summary of the proposed project, information on how to register as an Interested and Affected Party, and details on how comments could be submitted (**Annexure C**).

5.4. Site and Community Notice Boards

In addition to newspaper advertisements, physical notices were placed at strategic and accessible locations within the project area to ensure that local community members were adequately informed. Notices were displayed at the following locations:

- Okandjira Settlement Office;
- Proposed landfill site entrance;
- KJ Kapeua Combined School noticeboard;
- Ovitoto Police Station; and
- Otjzondjupa Regional Council Head Office in Otjiwarongo.

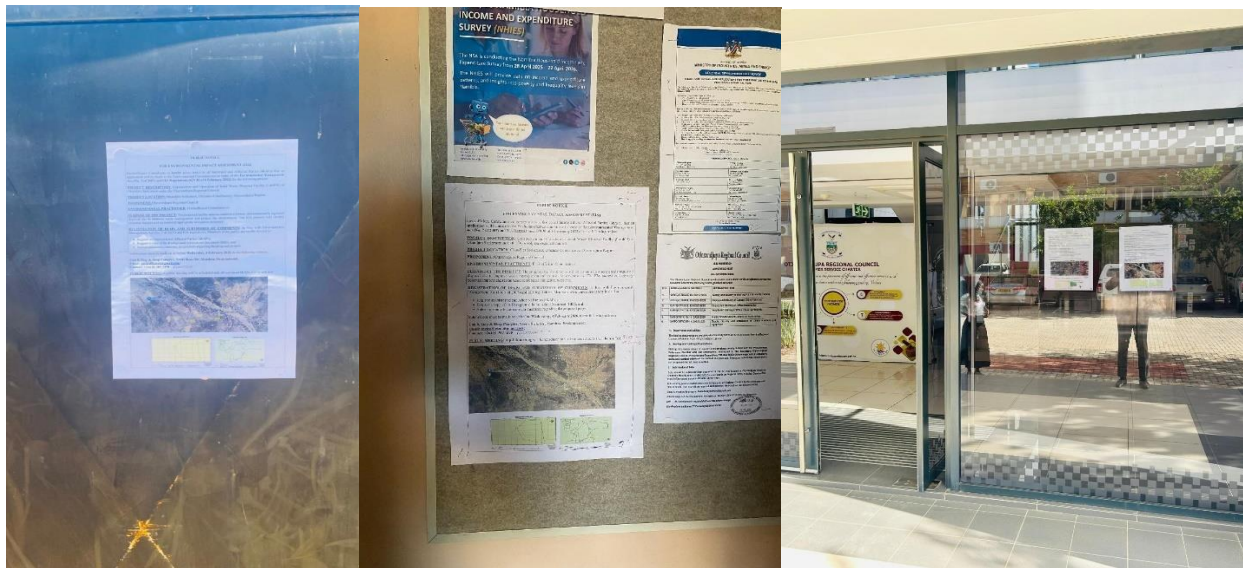


Figure 11 Notices at project area, Okandjira settlement noticeboard, and at Otjzondjupa Regional Council Head Office

5.5. Background Information Document

A Background Information Document (BID) was prepared to provide stakeholders with detailed and accessible information regarding the proposed Okandjira Landfill, including the project description, location, anticipated impacts, and the environmental assessment process. The BID was distributed to stakeholders and made available to interested parties upon request. A copy of the BID is attached as **Annexure D**.

5.6. Public Meeting

A public consultation meeting was held on 9 February 2026 at the Okandjira MICT Centre. The purpose of the meeting was to present the proposed project, outline the findings of the environmental assessment, and provide an opportunity for stakeholders to raise questions, comments, and concerns.

The meeting was attended by community members, local leadership, and representatives of relevant authorities. Participants actively engaged in discussions related to environmental protection, public health, land use compatibility, and operational management of the proposed landfill. Attendance registers, meeting minutes, and photographic records of the meeting are provided.



Figure 12 Public meeting held at the Okandjira Settlement Office, 9 February 2026.

Issues and concerns raised during the public consultation process have been recorded in an Issues and Responses Register and have been considered in the impact assessment and the development of mitigation measures presented in subsequent chapters of this report.

5.6.1. Summary of Issues Raised

The comments and concerns raised during the public consultation process have been documented in an Issues and Responses Trail Table 5.1 provides a summary of the key issues raised during the consultation process.

Table 5 Summary of Issues Raised During the Okandjira Public Consultation Process

THEME	ISSUE
Economic	<ul style="list-style-type: none"> Whether local businesses can recycle materials instead of disposing of them at the landfill (income generation and waste value recovery).
Health and Safety	<ul style="list-style-type: none"> Concern about waste reuse and street children scavenging at the landfill and consuming expired food (public health risk). Whether there is monitoring and proper operational management to ensure safe landfill operations
Infrastructure	<ul style="list-style-type: none"> Requirement for an Environmental Clearance Certificate (ECC) to establish and operate a private landfill facility.
Ecological	<ul style="list-style-type: none"> Concern about potential groundwater contamination due to soil type. Whether the land will be rehabilitated and returned for community use after the landfill's lifespan. Protective layers and leachate management to safeguard underground water. Whether water quality monitoring (before and after operations) will be conducted to assess environmental impact.

The feedback received has been incorporated into the environmental assessment and mitigation planning presented in subsequent chapters. All stakeholder comments, including those submitted in writing or during the public meeting, are recorded in **Annexure C**.

This chapter ensures compliance with EIA Regulations (2012), Section 21, and demonstrates that all interested and affected parties (I&APs) were given a fair opportunity to participate in the process.

6. IMPACT ASSESSMENT

6.1. Methodology Employed for the Impact Assessment

In compliance with the Environmental Impact Assessment (EIA) Regulations, (2012), a systematic assessment was undertaken to identify, evaluate, and rank the potential environmental and socio-economic impacts associated with the proposed Okandjira Landfill. The Regulations require that impacts be described in terms of their nature, extent, duration, intensity, probability, and overall significance, including any cumulative effects that may result from the proposed activity. The methodology comprised the following key steps:

6.1.1. Impact Identification

All potential impacts associated with the construction, operational, closure, and post-closure phases of the landfill were systematically identified. Impacts that fall outside the responsibility or reasonable control of the project proponent were excluded from further consideration.

6.1.2. Assessment and Screening

The baseline environmental and socio-economic data were reviewed to identify impact, the availability, quality, and adequacy. Baseline information was limited or uncertainty existed, conservative assumptions were applied to ensure a precautionary approach. In such cases, additional monitoring and management measures were recommended to address data gaps and reduce uncertainty.

6.1.3. Impact Characterisation and Significance Rating

Each impact was characterised based on a set of predefined criteria, including its nature, extent, duration, intensity, and probability of occurrence. The overall significance of each impact was determined and assigned a rating of low, medium, or high. Significance ratings were determined for both pre-mitigation and post-mitigation scenarios to evaluate the effectiveness of proposed mitigation measures.

In addition, a degree of confidence was assigned to each impact prediction, reflecting the reliability of available data and the level of professional judgement applied. This approach ensures that decision-making is informed by a clear understanding of potential risks and benefits, as well as the effectiveness of mitigation and management measures.

Table 6 Impact Assessment Criteria

Criterion	Definition
Nature	Type of effect on biophysical or socio-economic components (positive, negative, neutral).
Extent	Spatial scale of impact: site-specific, local (~15 km), regional (~100 km), national, or international.
Duration	Temporary, short-term (1-5 years), medium-term (5-10 years), long-term (>10 years), or permanent.
Intensity	Magnitude of impact: low, medium, or high.
Probability	Likelihood of occurrence: improbable, probable, highly probable, or definite.
Significance	Overall importance of the impact (low, medium, high).
Status	Positive or negative effect.
Degree of Confidence	Level of certainty in the assessment based on data quality and professional judgement.

Table 7 Significance Rating Definitions

Rating	Definition
Low	Negligible influence; impacts easily managed through standard controls.
Medium	Noticeable influence; requires mitigation and management measures.
High	Significant influence; may require design changes, intensive mitigation, or reconsideration of the activity.

6.2. Assessment of Impacts by Project Phase

The impacts associated with the Okandjira Landfill differ in nature and intensity depending on the project phase. For clarity, impacts are assessed separately for the construction phase and the operational phase. Closure and post-closure impacts are addressed in the EMP.

The nature and magnitude of impacts associated with the proposed Okandjira Landfill vary across the different phases of the project lifecycle. For clarity and consistency, impacts are assessed separately for the construction and operational phases. Impacts related to the closure and post-closure phases are addressed in detail within the Environmental Management Plan (EMP).

6.2.1. Planning Phase Impact Assessment - Okandjira Landfill

Planning and design phase impacts are critical in shaping the long-term environmental performance of the landfill. Inadequate planning, or insufficient engineering design can result in significant operational and post-closure environmental risks.

Table 8 Planning Phase Impact Assessment

Impact	Nature / Status	Extent	Duration	Intensity	Probability	Confidence	Significance (Pre-Mitigation)	Mitigation Measures	Significance (Post-Mitigation)
Inadequate public consultation	Negative	Local	Short-term	Medium	Probable	High	Medium	Continued stakeholder engagement; disclosure of reports;	Low
Failure to incorporate adequate leachate management system in the design	Negative	Local	Long-term	High	Probable	High	High	Engineering designs to include composite liner system, leachate collection pipes, leachate pond with lining, independent design review & approval prior construction	Medium
Failure to integrate rehabilitation and after-use planning	Negative	Site-specific	Long-term	Medium	Probable	Medium	Medium	Develop closure and rehabilitation plan before decommissioning	Low
Exclusion of local recycling and waste recovery opportunities	Negative (missed opportunity)	Local	Long-term	Medium	Probable	Medium	Medium	Integrate waste separation and recycling component into design	Positive (Low-Medium)
Budgetary or institutional planning gaps	Negative	Local	Long-term	High	Probable	Medium	High	secured funding; defined responsibilities	Medium

6.2.2. Construction Phase Impact Assessment - Okandjira Landfill

Construction phase impacts are temporary but can be significant if not properly managed. These impacts arise from site clearing, earthworks, material transport, infrastructure development, and construction activities. Although short-term in duration, construction impacts may affect soil stability, air quality, noise levels, traffic safety, and nearby receptors.

Table 9 Construction Phase Impact Assessment

Impact	Nature / Status	Extent	Duration	Intensity	Probability	Confidence	Significance (Pre-Mitigation)	Mitigation Measures	Significance (Post-Mitigation)
Dust generation from earthworks and traffic	Negative	Site-specific	Temporary	Medium	Probable	Medium	Medium	Regular water spraying; cover stockpiles; speed limits on access roads	Low
Soil erosion and sediment runoff	Negative	Local	Short-term	Medium	Probable	Medium	Medium	Stormwater diversion, sediment traps, rehabilitation of disturbed areas	Low
Vegetation clearance	Negative	Site-specific	Long-term	Medium	Highly probable	High	High	Minimise clearing; retain buffer zones; replant indigenous species	Medium
Noise from construction machinery	Negative	Site-specific	Temporary	Medium	Probable	Medium	Medium	Limit working hours; equipment maintenance	Low
Traffic safety risks	Negative	Local	Temporary	Medium	Probable	Medium	Medium	Traffic management plan; warning signage	Low
Employment creation	Positive	Local	Short-term	Medium	Highly probable	High	Positive (Medium)	Local labour preference	Positive (Medium)
Occupational health and safety risks (injuries, accidents)	Negative	Site-specific	Temporary	Medium	Probable	High	Medium	OHS plan, PPE, toolbox talks, first-aid facilities	Low
Fuel and oil spills from machinery	Negative	Site-specific	Short-term	Medium	Probable	Medium	Medium	Bunded fuel storage, spill kits, refuelling protocols	Low

Visual disturbance during construction	Negative	Local	Temporary	Low	Highly probable	High	Low	Site housekeeping, temporary screening	Low
Discovery of archaeological or heritage resources	Negative	Site-specific	Permanent	High	Improbable	Medium	Medium	Chance finds procedure, stop-work protocol, notify NHC	Low
Risk to groundwater during liner installation (construction defects)	Negative	Site-specific	Long-term	High	Improbable	Medium	Medium	Quality control supervision	Medium
Social conflict over local employment opportunities	Negative	Local	Short-term	Medium	Probable	Medium	Medium	Transparent recruitment process based on laws;	Low
Informal waste picking during construction	Negative	Site-specific	Short-term	Medium	Probable	Medium	Medium	Site fencing; security personnel	Low
Disturbance of nearby residents (communication gaps)	Negative	Local	Temporary	Low	Probable	Medium	Low	Advance notice of construction schedule; complaint register	Low

6.2.3. Operational Phase Impacts

Operational impacts represent the most significant risks associated with landfill development and persist over the life of the facility. These impacts relate to waste deposition, leachate and gas generation, traffic movement, public health risks, and nuisance effects.

Table 10 Operational Phase Impact Assessment

Impact	Nature / Status	Extent	Duration	Intensity	Probability	Confidence	Significance (Pre-Mitigation)	Mitigation Measures	Significance (Post-Mitigation)
Groundwater contamination by leachate	Negative	Local	Long-term	High	Highly probable	High	High	Liner system, leachate collection and treatment, groundwater monitoring	Low

Surface water pollution	Negative	Local	Long-term	Medium	Probable	Medium	Medium	Stormwater management, runoff control, sediment traps	Low
Odour nuisance	Negative	Local	Long-term	Medium	Highly probable	Medium	High	Daily cover, waste compaction, buffer zones	Medium
Landfill gas emissions	Negative	Site/local	Long-term	High	Probable	Medium	High	Gas venting/collection, monitoring, fire prevention measures	Medium
Public health risks (disease, pests)	Negative	Local	Long-term	Medium	Probable	Medium	Medium	Pest control, hygiene facilities, PPE, health monitoring	Low
Bird strike hazard	Negative	Local/regional	Long-term	High	Probable	Medium	High	Weekly cover, vegetation control, bird deterrents	Medium
Fire risk	Negative	Site-specific	Long-term	High	Probable	Medium	High	Fire-fighting equipment, gas control, trained staff	Low
Increased traffic	Negative	Local	Long-term	Medium	Probable	Medium	Medium	Traffic management plan, road maintenance	Low
Job creation	Positive	Local	Long-term	Medium	Highly probable	High	Positive (Medium)	Skills training, local employment	Positive (Medium)
Illegal disposal of hazardous waste	Negative	Local	Long-term	High	Probable	Medium	High	Waste screening, access control, staff training	Medium
Loss of amenity (litter, dust, noise beyond site boundary)	Negative	Local	Long-term	Medium	Highly probable	Medium	Medium	cover, litter fencing, dust suppression, monitoring	Low
Institutional capacity failure (poor management or monitoring)	Negative	Local	Long-term	High	Probable	Medium	High	Adequate staffing, training, audits, compliance reporting	Medium
Post-closure land-use limitation	Negative	Site-specific	Long-term	Medium	Definite	High	Medium	Closure and rehabilitation plan,	Low

								soil cover, after-use planning	
Cumulative impacts of long-term waste disposal	Negative	Local	Long-term	Medium	Highly probable	Medium	Medium	Phased development, capacity monitoring, waste minimisation	Low
Scavenging by street children and vulnerable groups	Negative	Site-specific	Long-term	High	Probable	High	High	Controlled access; fencing; security; social support coordination	Medium
Consumption of expired food from landfill (public health risk)	Negative	Local	Long-term	High	Probable	High	High	Waste compaction and daily cover; restricted access; awareness campaigns	Medium
Economic exclusion of informal recyclers	Negative	Local	Long-term	Medium	Probable	Medium	Medium	Formalise recycling initiatives; allocate sorting area; support SMMEs	Positive (Low-Medium)
Failure of leachate evaporation pond	Negative	Site-specific	Long-term	High	Improbable	Medium	High	Regular inspection; pond lining; emergency overflow measures	Low
Community dissatisfaction, and to lack of reporting of incidences	Negative	Local	Long-term	Medium	Probable	Medium	Medium	Submission of Bi-Annual environmental reports	Low

6.3. Discussion of Key Impacts

The proposed Okandjira Landfill has been assessed across the planning, construction, operational, and closure phases. The assessment indicates that while several impacts of moderate to high significance may occur prior to mitigation, the majority can be reduced to low significance through appropriate design, management, and monitoring interventions.

6.3.1. Planning and design phase

The planning phase is fundamental in determining the long-term environmental performance and sustainability of the landfill. Decisions taken during this phase have direct implications for ecological integrity, groundwater protection, and community acceptance.

The most significant planning-phase risk identified is the potential failure to incorporate an adequate leachate management system into the engineering design. Without a properly designed composite liner, leachate collection network, and lined evaporation or treatment facility, the risk of groundwater contamination would be high and long-term in nature. The concerns raised by stakeholders regarding underground water resources and soil conditions, this issue represents the most critical ecological consideration at the design stage.

6.3.2. Construction Phase

Construction-phase impacts are generally short-term, site-specific, and manageable through standard environmental control measures. The primary impacts include dust generation from earthworks and vehicle movement, soil erosion and sediment runoff, vegetation clearance, noise from machinery, traffic-related risks, and occupational health and safety hazards.

Vegetation clearance represents the most notable ecological impact during construction; however, its significance can be reduced through minimising the cleared footprint, of only clearing tree at the area to be built, or when necessary. The protected trees in the area should be preserved.

Occupational health and safety risks are inherent to construction activities and require strict adherence to an approved Health and Safety Plan, provision of personal protective equipment, regular toolbox talks, and on-site first-aid facilities.

Socio-economically, the construction phase will result in temporary employment opportunities and potential local procurement benefits. Minor social conflicts may arise regarding employment allocation, these can be mitigated through transparent

recruitment processes and community liaison mechanisms and prioritising residents, especially for semi-skilled and unskilled job opportunities.

Proper supervision, compliance monitoring, and implementation of mitigation measures, construction impacts are expected to remain low after mitigation and are not considered fatal flaws to the project.

6.3.3. **Operational Phase**

The operational phase presents the highest environmental and social risk profile, as impacts persist over the lifespan of the facility and involve continuous waste deposition, leachate and gas generation, and increased human activity.

6.3.3.1. **Groundwater and Surface Water Protection**

Groundwater contamination from leachate is identified as the most significant potential impact. If liner systems fail or leachate collection systems are inadequately maintained, contamination could occur over the long term with serious ecological and public health consequences. Installation of a properly engineered liner system, leachate collection infrastructure, lined evaporation ponds, and a structured groundwater monitoring programme can reduce residual risk to low significance.

Surface water pollution may result from stormwater runoff if drainage systems are poorly designed or maintained. Adequate stormwater diversion, runoff control, and sediment management measures are therefore essential.

6.3.3.2. **Public Health and Safety**

Operational risks include exposure to disease vectors, odour nuisance, landfill gas emissions, fire hazards, and bird strike hazards. Scavenging by vulnerable individuals and children is a risk, with public health implications of consuming expired food from the landfill. These concerns were strongly raised during stakeholder engagement and are considered valid.

Mitigation measures must include controlled site access, perimeter fencing, on-site security, daily-weekly or when necessary waste covering, pest control programmes, and strict operational supervision. Landfill gas must be appropriately vented or managed to prevent fire risks and potential health hazards.

6.3.3.3. **Institutional and Management Capacity**

The effectiveness of mitigation measures depends heavily on institutional capacity. Poor management, insufficient staffing, or lack of monitoring and reporting could significantly elevate environmental risks. Institutional failure is therefore considered a

high pre-mitigation impact. The presence of a legally binding Environmental Management Plan (EMP), regular audits, and regulatory oversight will be critical in ensuring compliance and long-term sustainability.

6.3.3.4. **Socio-Economic Considerations**

The operational phase will create long-term employment opportunities and strengthen regional waste management infrastructure. The integration of recycling and material recovery initiatives has the potential to generate income for local businesses and reduce the overall waste burden, and enhance the socio-economic justification of the project.

6.4. **Closure and Post-Closure Phase**

Upon reaching capacity, the landfill must undergo proper decommissioning and rehabilitation. Failure to implement a structured closure plan could result in prolonged environmental degradation, settlement issues, or land-use restrictions.

If managed correctly, closure activities will include final capping, soil covering, stabilisation, revegetation, and continued monitoring of groundwater and gas emissions. Properly rehabilitated landfill sites have been successfully converted into compatible land uses in other contexts, including green spaces. Long-term aftercare and monitoring remain essential to prevent delayed environmental impacts.

7. CONCLUSIONS

The Environmental Impact Assessment concludes that the proposed Okandjira Landfill is viable, although the most critical impact relates to groundwater contamination from leachate, followed by public health risks associated with scavenging, disease vectors, and landfill gas.

Construction impacts are temporary and manageable. Planning-phase risks can be effectively mitigated through robust engineering design, baseline data verification, and proactive stakeholder engagement. The success of the project ultimately depends on strong institutional capacity, strict adherence to the Environmental Management Plan, and effective regulatory oversight.

The implementation of all recommended mitigation measures and monitoring programmes, most impacts can be reduced to low residual significance. No fatal flaws have been identified that would preclude the development of the landfill.

8. RECOMMENDATIONS TO THE ENVIRONMENTAL COMMISSIONER

It is recommended that the Environmental Clearance Certificate (ECC) be granted for the proposed Okandjira Landfill, subject to the following strict and enforceable conditions:

- **Environmental Management Plan (EMP)** shall be implemented in full throughout all project phases. The EMP shall function as a live document and be updated as necessary to reflect monitoring results, operational experience, and any additional ECC conditions **Annexure F**.
- **Engineering Design and Groundwater and Surface water Protection:** A composite liner system and engineered leachate collection and management system shall be installed to protect geohydrological resources. Stormwater diversion channels and runoff control measures shall be incorporated into the final design by a registered engineer prior construction.
- **Public Health and Safety Measures:** Controlled site access shall be enforced through fencing and security to prevent unauthorised entry and scavenging. Waste screening procedures shall be established to prevent hazardous waste disposal. Waste compaction and cover shall be applied when necessary to minimise odour, litter, and pests. Hygiene facilities shall be provided, and PPE shall be mandatory for all workers.

- **Community Engagement and Grievance Mechanism:** A formal complaints and grievance mechanism shall be maintained throughout the operational phase. Complaints shall be recorded, investigated, and addressed in a timely and transparent manner, and shall be included in the Bi-annual reports to be submitted to DEA.
- **Institutional Capacity and Budgeting:** The Otjozondjupa Regional Council shall demonstrate and maintain adequate financial and institutional capacity to operate, monitor, and maintain the facility over its lifespan. Budget provisions shall include operational costs, monitoring, training, audits, and compliance reporting.
- **Closure and Post-Closure Management:** A detailed Closure and Rehabilitation Plan shall be prepared and approved prior to closure of the landfill. The Council shall retain responsibility for closure, post-closure monitoring, site stabilisation, pollution prevention, and enabling compatible future land use.
- **Recycling and Waste Recovery Initiatives:** Recycling and material recovery initiatives should be incorporated to enhance local economic benefits, reduce landfill pressure, and promote sustainable waste management practices.

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