



Application No: APP-001303

**ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED WASTE
DISPOSAL SITE AT NEUDAMM EXPERIMENTAL FARM,
KHOMAS REGION**

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CONSULTANT:

Mr. Ipeinge Mundjulu (BSC, MSc)

Red-Dune Consulting CC

P O Box 27623

PROPONENT

University of Namibia

Private Bag 13301

Windhoek

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ACRONYMS

| | |
|-------------|--|
| DEA | Department of Environmental Affairs |
| EA | Environmental Assessment |
| EAP | Environmental Assessment Practitioner |
| EC | Environmental Commissioner |
| ECC | Environmental Clearance Certificate |
| ECO | Environmental Compliance Officer |
| EIA | Environmental Impact Assessment |
| EMA | Environmental Management Act (No. 7 of 2007) |
| EMP | Environmental Management Plan |
| FANR | Faculty of Natural Resources |
| MET | Ministry of Environment and Tourism |
| PPE | Personal Protective Equipment |
| RD | Red-Dune Consulting CC |
| SM | Site Manager |
| UNAM | University of Namibia |

EXECUTIVE SUMMARY

To comply with the provision of the Environmental Management Act (Act. No. 7 of 2007) (EMA), the University of Namibia (UNAM), had initially developed an Environmental Management Plan (EMP) for the waste disposal site at the experimental farm for purposes of applying for the Environmental Clearance Certificate (ECC). The application was NOT approved due to the location of the waste site which was found to be located in the riverbed. The office of the Environmental Commissioner advised that, UNAM must find an alternative site and develop a decommissioning plan for the current waste site.

The experimental farm is used for castration, dehorning breeding as well as vaccinating of cattle. These activities are carried out by lectures and students with the support of farm workers. There are about 12 farm workers at the experimental farms. On average, each household at the experimental farms have about 4 people including school going children. It is mainly the waste from these household (paper, plastic, wood, broken furniture, bottles and glass) which are disposed at the existing waste disposal sites.

The current waste site has a fenced area of 0.54 hectares (ha), while the excavated area where waste is disposed is 0.1 hectares. Household waste has been disposed at this site for over 50 years, without expansion, mainly because they were burned. Hazardous waste is not disposed at the sites, UNAM has a contractor that collects hazardous waste and takes it to Windhoek's Kupferberg hazardous landfill site.

UNAM has re-appointed Red-Dune Consulting CC to identify a suitable site at the experimental farm and develop a decommissioning plan for the existing site. The department of Environmental Health for UNAM and Red-Dune has then identified a new site. Initially, two sites were identified, after careful consideration of impacts, a site which is about 170m north west of the existing site was found to be suitable. The site stands on an elevation and away from the river bed. Furthermore, there is an existing road to the site.

The fenced area for new site will be 6000m² (0.6ha), which is just little over half a football field. The initial area to be excavated will be 2000m² (0.2ha) to a depth of 1.5-2m which is above any possible ground water in the area. The site will be in a shape of a square, with both sides measuring 60m long. The foundation of the fence will be constructed to act as storm

water. The size for the new site took into consideration the existing site, which has been in operation for over 50 years and has only been using an excavated area of 1000m² (0.1ha). Hence it is envisioned that the new site will be in operation for the 100 years.

Chapter 1

1. Introduction

The University of Namibia (UNAM) operates various campuses around the country with two agricultural campuses, Ogongo and Neudamm under the Faculty of Faculty of Agriculture and Natural Resources (FANR). Neudamm campus is the leading agriculture training institution in the country. The Campus is home to the Department of Agricultural Economics and Extension, Department of Animal Science, Department Food Science and Technology and the Department of School of Veterinary Medicine (SoVM). The campus has a farm measuring 10, 187 hectares which has over 700 cattle, small livestock and wild animals.

The campus operates an experimental farm on camp 3 ‘hereinafter referred to as C-3’. The experimental farm is mainly used for animal husbandry activities such as, castration, dehorning and breeding of cattle (Figure 1).



Figure 1. A mating / breeding kraal and a normal cattle handling kraal

The experimental farm is supported by 12 farm workers whose households are situated there. UNAM operates a small waste disposal site at the experimental farm to cater for the household waste generated by farm workers and during student practical (paper, plastic, wood, broken furniture, bottles and glass). Hazardous waste is not disposed at the site. UNAM has a contractor. that collects hazardous waste and disposes them to the Windhoek’s Kupferberg hazardous landfill site. Furthermore, dead animal carcasses, particularly those that died of natural causes of suspected illness are incinerated at an

approved incinerator at Neudamm campus. Reference to the approved incinerator is APP-00281.

To comply with the provision of the Environmental Management Act (Act. No. 7 of 2007) (EMA), (UNAM), had initially developed an Environmental Management Plan (EMP) for C-3 waste disposal site for purposes of applying for the Environmental Clearance Certificate (ECC). The application was **NOT** approved due to the location of the waste site which was found to be located in the riverbed. The office of the Environmental Commissioner (EC) advised that, UNAM must find an alternative site and relocated the existing C-3 waste disposal site (APP-00279).

1.1. Regulatory Requirements

The protection of the environment is provided for under article 95(1) of the Namibia Constitution and the Environmental Management Act 2007 (Act No 7 of 2007) (EMA).

EMA has listed activities that may not be undertaken without an Environmental Clearance Certificate (ECC). The construction and/or operation of facilities for waste site is a listed activity that must not be undertaken without an ECC (Table 1).

Table 1. Listed activities that are triggered by the proposed project

| Activity | Listed Activity under EMA |
|-----------------------------------|---|
| Operation of Waste disposal Sites | 2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste; |

The provision of EMA requires that the relocation of an existing site to a virgin land necessitates that an EIA must be undertaken to assess the impacts of construction and operation of the proposed activity at the new site.

It is against the above statutory requirement that the UNAM has contracted Red-Dune Consulting CC (RDC) to identify a new site and consequently undertake an environmental impact assessment the new site.

1.2. The need and desirability of the project

Neudamm campus is remotely located and it is inevitable that it would require supporting infrastructure for its activities. The current waste disposal site was found not to be suitable located and needs to be closed / decommissioned. Additionally, the dangers of uncontrolled waste management, especially the danger that the current waste site pose to the water resource are severe and contravenes the provision of the Water Resource Act (Act No. 11 of 2011).

1.3. Terms of reference

The Terms of Reference (TORs) of this EIA is in accordance with the Environmental Management Act 2007 and its Regulation Section 9 (a-b). It further considers other relevant local, national and international laws. These guidelines are aimed to focus on issues of greater environmental concerns and to develop mitigation measures for effective environmental management. The TORs of this project includes, but not limited to the following;

- Provide a comprehensive description of the proposed Project;
- Identify relevant legislation and guidelines for the project;
- Identify potential environmental (physical, biological and social) conditions of the project location and conduct risk assessment;
- Inform Interested and Affected Parties (I&APs) and relevant authorities about the proposed project to enable their participation and contribution;
- Develop an Environmental Management (EMP) that would be a legal guideline for the environmental protection by the project

1.4. Scope

The scope of this project is guided by the Environmental Regulations 2012, which follows the process as shown in figure 2. The scope aims at identifying possible impacts, assessing the impact and formulate the optimum, practical mitigation measure to minimize the impacts. This EIA shall strive to address issues of air pollution, land degradation, surface and ground water pollution, health and safety for human and animals

and general littering. In the end, Red-Dune (RD) believes the developed EMP would provide practical mitigation measure that ensure sustainable management of the waste disposal site. Further, with this report, RD believes that, the information provided is sufficient to enable the Environmental Commissioner to approve the project and issue the Environmental Clearance Certificate.

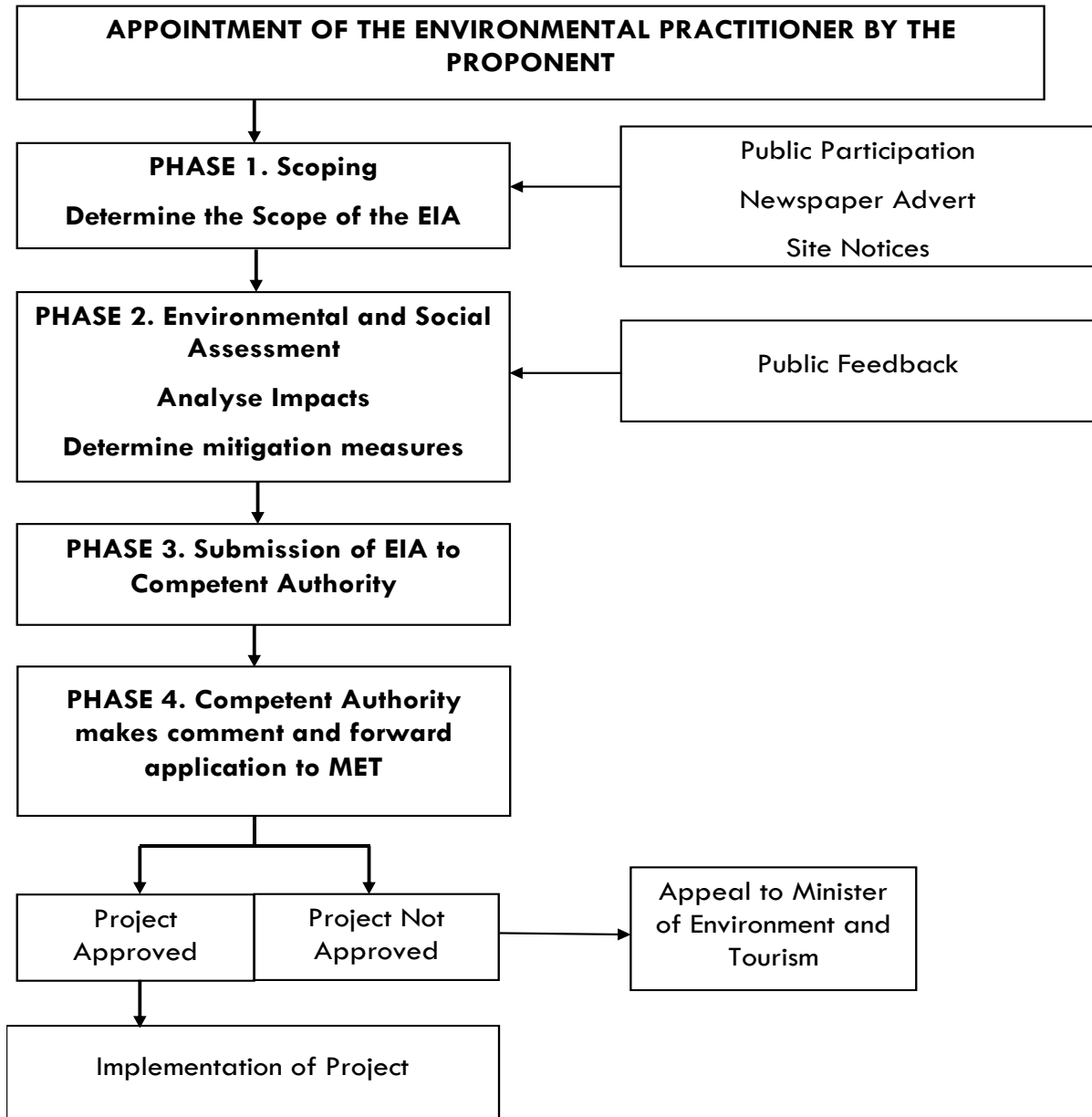


Figure 2. The Scope of the EIA Process in Namibia

Chapter 2

2. Project Description

2.1. Location

Neudamm campus is remotely located about 30 kilometres east of Windhoek left, on the B1 road to Hosea Kutako International Airport. The proposed alternative sites are located at Neudamm experimental farm. Site A is located at **-22.438611°S, 17.3397222°E** and alternative site B is located at **-22.438333°S, 17.337500°E** (Figure 3). Please note that, the considered alternative site is A.

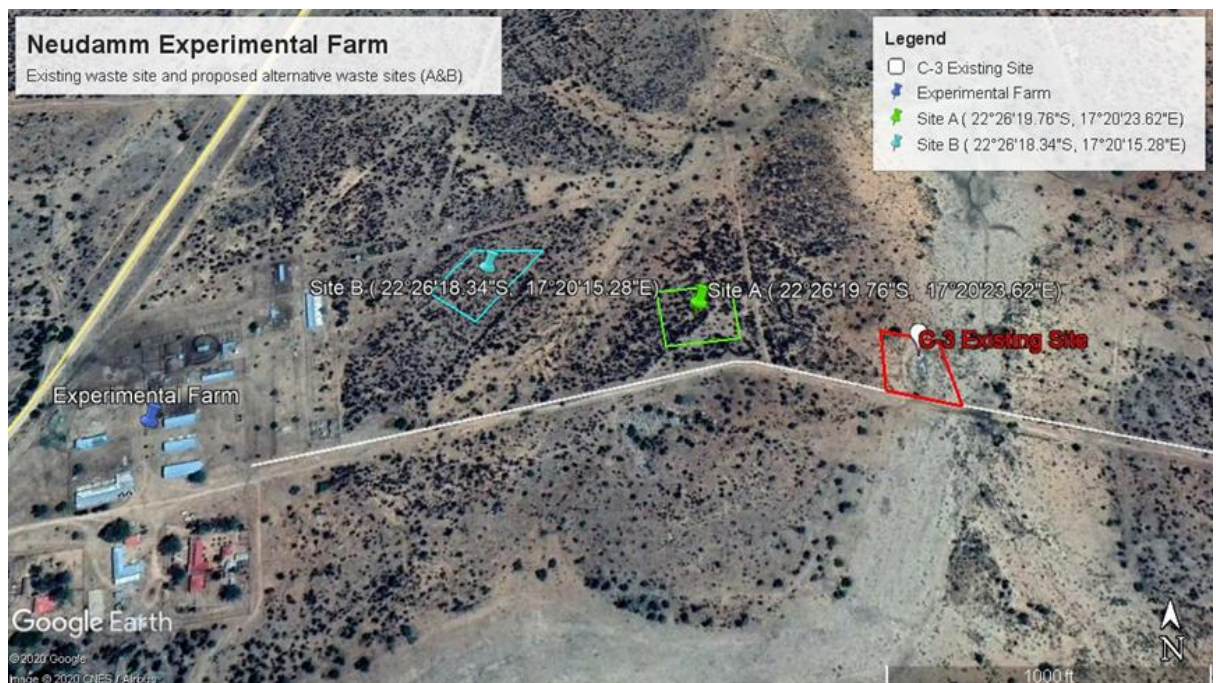


Figure 3. Existing waste site and the proposed alternative sites

2.2. Design and Engineering

The design of a waste disposal depends on the type and amount of waste to be disposed. Some waste disposal sites are known to pose major environmental threat through leachate, vermin and disease and odours. Their site requires advance engineering such as containment of leachate. These are sites that cater thousands of people, mostly found in populated towns and cities.

2.2.1. Size

There are only 12 households at the experimental farm. Students and lectures commute from the campus during practical only; hence their household waste is not necessarily disposed of at the experimental farm. Neudamm has an approved waste site at camp 2, which is 11 kilometres from the experimental farm that caters for the campus waste (C-2). The initial analysis showed that, it was not possible for UNAM for be transporting waste from experimental farm to the C-2 due to logistics.

The fences are for proposed site will cover an area of 6000m² (0.6 ha). However, the foot print where the waste will be disposed will be 2000m² (0.2 ha). The site will be excavated to a depth between 1.5m- 2m deep. These measurements were derived with consideration of the existing waste site which measured 5400m² (0.54ha) and had foot print of 1000m² (0.1ha) where waste has been disposed at this footprint for over 50 years. Although the amount of waste produced over the years is not known the lifespan of the existing small site indicates that, minimal waste is generated. The ground will be compacted and the fence foundation will act as a storm water barrier.

2.3. Type of waste disposal

Normally, the type of a waste disposal site depends on the type of waste to be disposed and the population it serves. Waste disposal sites are classified into three classes, Class A, B and C. Class A&B waste disposal sites are known to pose major environmental threat through leachate, vermin and disease and odours. Their site requires advance engineering such as containment of leachate and harvesting of methane. These are site, that cater for thousands of people, mostly found in bigger towns. The Class C waste site are considered low risk. Waste is mainly from residential sources, no visible leachate, and the potential for future contamination is low

Owing to the fact that, this site will serve less than 12 households and the fact that, no leachate has been observed at the existing waste site, an ordinary household waste disposal site shall be constructed.

2.3.1. Waste classification

An important aspect when deciding on the type of a waste disposal site is the type of waste to be disposed. In this document and for the purposes of the proposed waste site, the hazardous waste is classified into four main categories. This is made for ease classification and to ensure unauthorized waste is not disposed at the site.

- **Ignitability** these are solid waste that are highly flammable such as oxidizer.
- **Corrosivity**, these waste that are highly corrosive such as hydrochloric acid
- **Reactivity** these are waste that are highly reactive with potential to explode
- **Toxicity** these are poisonous waste materials which pose a threat to groundwater and can have long term effects to human health and the environment.

Therefore, any waste that falls in the above category must not be disposed at the proposed waste site but only general household waste as mentioned before could be disposed at the site.

2.4. Engineering

To ensure maximum safety and in the absence of containment, a 2m buffer zone between the base preparation layer and the water table is recommended. Studies have indicated that, the water table at Neudamm area is found between 5-10m. A base layer of 150mm compacted shall be applied and it is on this base layer that the waste body would be disposed (Figure 4). The fence foundation will be constructed to act as a storm water protection.

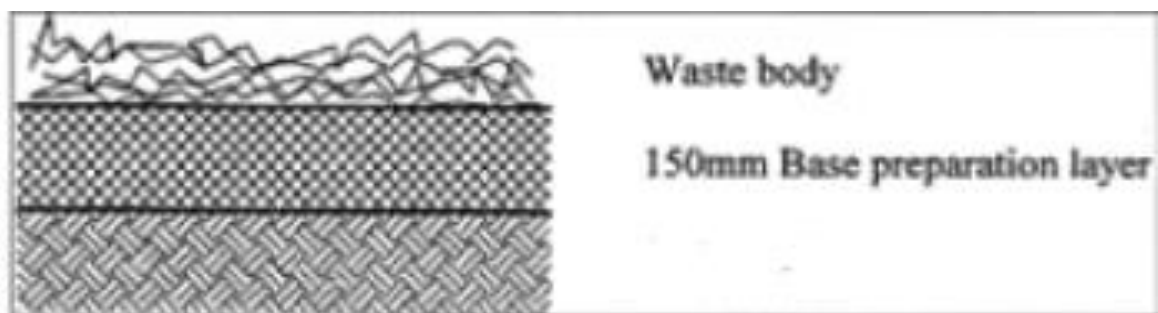


Figure 4. Schematic illustration of the proposed waste disposal site

2.5. Construction activities

- The following construction activities shall take place;
- Land clearing
- Excavation of disposal area
- Installation of boundary fence

Chapter 3

3. Description of the Affected Environment

3.1. Environmental Parameter

3.1.1. Climate

The Khomas highland has moderate temperatures and average rainfalls. The average day temperatures lie at 30° C in January to 20° C in July, while the night lie between 17° C in January and 7°C in June. Average annual rainfall ranges between 350 – 400mm. Most of the rainfall is received from January to May (Mendelsohn *et al* 2009).

3.2. Geomorphology

3.2.1. Geology and Soils

Half of Namibia surface area is bedrock exposure, while the other half is covered by Cenozoic deposits of the Kalahari and Namib Deserts (Geological Survey of Namibia 2011). The Windhoek central areas, which includes Neudamm Farm belongs to the southern and south central zones of the precambrian Damara Orogen, one of the oldest rock which is ± 700 to ± 1100 million years of age (Mendelson *et al* 2009).

The bedrock in central Namibia is deeply weathered and not a good basis for soil development. This is because leaching of mineral in old bedrock is limited, rather, the soils are rich in material derived from physical weathering (Silke *et al* 1999). The soils lack organic matter because of low litter supply and rapid mineralization. The Khomas highlands consists of Lithosols/Xerosols, which are two major soil groupings. Lithosols are soils limited in depth by continuous hard rock within 10 cm of the surface and develop mainly in mountainous areas.

3.2.2. Topography and Hydrology

Neudamm farm is located on an elevation between 1600m-1800m above sea level. The area has undulating terrain formed by hills and some flat areas. The hills formed various catchment areas that forms tributaries that flows into the Seeis River during

rainfall. The Seeis river, an Ephemeral River, flows from Khomas highland toward the east where it disappears into the Kalahari basin at Okapanje area. The average day temperatures in the Khomas highlands lie at 30° C in January to 20° C in July, while the at night, temperature ranges between 17° C in January and 7° C in June. Average annual rainfall ranges between 350 - 400 Most of the rainfall is received from January to May.

3.3. Biodiversity

3.3.1. Flora

The central mountainous are of Namibian is classified as the semi-arid highland savanna. Like most part the area, the area is known to be affected by bush encroachment (Joubert et al., 2008). The vegetation is characterized by woody species such as *Acacia Mellifera*, *A. hereroensis*, *A. hebeclada*, *A. reficiens*, *Euclea undulata*, *Dombeya otundifolia*, *Tarchonanthus camphoratus*, *Rhus marlothii*, *Albizia anthelmintica* and *Ozoroa crassinervia* and various species of grass (Joubert et al., 2008).

The project area is sparsely vegetated by one encroacher shrubs of *Acacia Mellifera* only (Figure 5). There are no mature trees or protected trees. Henceforth, there is no impact on vegetation.



Figure 5. Encroacher shrubs of *Acacia Mellifera* at the site

3.3.2. Fauna

Generally, Neudamm farm consist of large stock animals of Afrikander Cattle, dairy cows and horses. It also has small livestock, mainly breeds of sheeps as well as wild animals including Oryx, waterbucks, kudus, hartebeests, warthogs and baboons. The proposed site is frequented by domestic animals, which normally roams around the farm. During site visit, there was no sighting of animals, except small birds.

It is not anticipated that, the construction and operation of site A will have impact on the fauna

3.4. Socio-Economic Environmental

3.4.1. Land Use

Neudamm Campus is located on the farmland which comprises of mix use, educational institution and farming. The farm is surrounded by commercial farms and estate developments. The proposed waste disposal site does not pose any environmental threat to the surrounding neighbors.

3.4.2. Population Demography

The Neudamm farm is operated similar to a commercial farm. Its employees live on the farm while some live on the campus. The children of the employees attend school in Windhoek, where they commute everyday with the bus. Overall, the campus and farm has a population of less than 300. This number is more than halved during school holidays, which further explain why the campus has been using relatively smaller waste disposal sites for over 50 years and they have not reached capacity. The experimental farm has a population of less than 40 people.

Chapter 4

4. Project Alternatives

The provision of EMA requires an EIA to explore various project alternative to ensure that environmental impacts are minimized to insignificant level. These alternative ranges from not implementing the project (No go alternative) project site, technology (if any) and equipment alternatives etc. The description of alternative is given in the table 3 below.

Table 2. Project alternatives

| Alternative | Description | Advantages | Disadvantage | Chosen Option after mitigation measures |
|--------------------|--|--|---|--|
| No Project | This alternative would keep a status quo, where Neudamm would not close waste disposal sites that are badly located in the river stream. | <ul style="list-style-type: none">• The new site had shrubs and natural beauty that would be disturbed when cleared. | <ul style="list-style-type: none">• The campus would continue to have unsustainable management of solid waste• The current site may pollute water in the long term | No |

| | | | | |
|---------------------------|--|---|--|-----|
| Implement project | This entails the implementation and operation of the project | <ul style="list-style-type: none"> • The Campus shall have an adequate solid waste management strategy. • The proposed site is suitable located and not in the river stream • The operation of the waste site shall be in conformity with the EMA. | <ul style="list-style-type: none"> • The loss of pristine characteristic of an area | Yes |
| Proposed Alternative Site | Keep the current waste disposal site, and develop and EMP for continued operation. | <ul style="list-style-type: none"> • The campus has over 50 years managed to handle waste because of the current site. | <ul style="list-style-type: none"> • The current site on the edge of the river stream, hence the relocation of the site to this proposed one. | Yes |

Chapter 5

5. Policy and Legal Framework

The project approval and operation shall be subject by the following national and international laws (Table 3).

Table 3. Policy and Legal framework governing the project

| REGULATORY FRAMEWORK | SUMMARY | APPLICABILITY |
|---|--|---|
| The Namibian Constitution | The State shall actively promote and maintain the welfare of the people by adopting policies aimed at ... The maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future | Protection of the environment and biodiversity |
| Environmental Management Act No. 7 of 2007 | This act aims to promote the sustainable management of the environment and the use of natural resources and to provides for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters | The acts provide a list of activities that may not be undertake without an environmental clearance certificate to prevent environmental damages |

| REGULATORY FRAMEWORK | SUMMARY | APPLICABILITY |
|---|---|---|
| Draft Pollution Control and Waste Management Bill | This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management | To protect the Environment from possible hydrocarbons and oil leaks from the machinery and vehicles |
| Environmental Policy framework (1995) | This policy subjects all developments and project to environmental assessment and provides guideline for the Environmental Assessment. | Consideration of all possible impacts and incorporate them in the development stages |
| National Solid Waste Strategy | The strategy to control and manage solid waste in Namibia | Solid waste dumped at the site |
| Regulations Related to the Health and Safety of Employees at Work. Reg No. 156 | Promotes the Safety and Health of employees at the work place | Employees subjected to noise and dust |
| Public Health and Environmental Act No. 1 of 2015 | To Protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health. | Application of proper mitigation measure to prevent aesthetic pollution and water pollution |

| REGULATORY FRAMEWORK | SUMMARY | APPLICABILITY |
|--|---|--|
| Medicines and Related substances control Act No. 13 of 2003 | To provide for the establishment of a Namibia Medicines Regulatory Council; for the registration of medicines intended for human and for animal use; for the control of medicines and scheduled substances; and to provide for incidental matters. | The handling and management of animal medicines |
| Veterinary and Veterinary Para-Professions Act, 2013 (Act No. 1 of 2013), | To provide for the establishment, constitution, powers and functions of the Namibian Veterinary Council; to regulate the registration of persons practising veterinary professions and veterinary para-professions; to specify the education and training and qualifications of persons practising such professions; to provide for control over the practising of veterinary professions and veterinary para-professions; to prohibit the practising of any such profession without being registered; to repeal the Veterinary and Para-Veterinary Professions Proclamation, 1984; and to provide for matters incidental thereto | The establishment and operation of School of Veterinary Medicine is guided by this act. |
| Labour Act No. 11 of 2007 | This Act outlines the labour laws which encompass protection and safety of employees at work. | This project will require labour during its operational stage and decommissioning stage. |

| REGULATORY FRAMEWORK | SUMMARY | APPLICABILITY |
|--|---|--|
| Water Act No, 54 of 1956 | All water resources belong to the State. It prevents pollution and promotes the sustainable utilization of the resource | Prevention of discharging contaminated water at unauthorised places |
| Soil Conservation Act No. 76 of 1969 | To promotes the conservation of soil, prevention of soil erosion | Uncontrolled movement of heavy vehicles and truck at areas surrounding the site may cause land degradation |
| Water Resource Management Act No.11 of 2011 | The Act stipulates the prevention of both Surface and Ground water sources. | Possibility of surface and groundwater contamination. |
| National Heritage Act No.27 of 2004 | The Act gives provision of the protection and conservation of places and objects with heritage significance. | There were no heritage features identified on site or within the close vicinity of the site. |

Chapter 6

6. Impact identification

The standard practice of impact identification using a checklist method was used to identify potential environmental impacts during construction and operational phase (Table 4 & 5). This process resulted from literature, site assessment, and public participation processes.

Table 4. Impact identification during Construction

| Potential Impact | Physical Environment | | | | Biological Environment | | Human Environment | | | | |
|--------------------------|----------------------|---------------|-------------|-------|------------------------|-------|-------------------|--------|--------------|------------|----------|
| | Land Degradation | Water Quality | Air Quality | Noise | Flora | Fauna | Health | Safety | Displacement | Employment | Heritage |
| Digging & Excavating | X | | | | X | X | X | X | | | X |
| Oil Spill | X | X | | | | | | | | | |
| Exhaust Emission | | | X | | | | | | | | |
| Machinery Noise | | | | X | | X | X | | | | |
| Accident | | | | | | | | X | | | |
| Occupational Health Risk | | | | | | | X | | | | |
| HIV/AIDS | | | | | | | X | | | | |
| Employment | | | | | | | | | | X | |
| General Waste | X | | | | | | X | | | | |

Table 5. Impact identification during Operation Phase

| Potential Impact | Physical Environment | | | | Biological Environment | | Human Environment | | | |
|--------------------------|----------------------|---------------|-------------|-------|------------------------|-------|-------------------|--------|------------|----------|
| | Aesthetic value | Water Quality | Air Quality | Noise | Flora | Fauna | Health | Safety | Employment | Heritage |
| Solid Waste | X | | X | | | | | | | |
| Transport | | | X | | | | | X | | |
| Occupational Health Risk | | | | | | | X | X | | |
| HIV/AIDS | | | | | | | X | | | |

6.1. Criteria for impact assessment

The criteria used to assess the impacts and the method of determining their significance is outlined in Table 6. This process conforms with the Environmental Impact Assessment Regulations of Environmental Management Act, 2007 (Government Gazette No. 4878) EIA regulations. The approach for determining and analyzing impacts is undertaken into two steps.

- **Impact Determination;** during this step, the impact is assessed based on severity, spatial scale and its duration.
- **Impact Significance;** various rating exists to determine the overall rating of the impact

Impact significance is determined under two mitigation scenarios; without mitigation and with mitigation. The confidence of impact mitigation depends on the level of certainty based on available information to assess the impact. Impacts whose level of uncertainties

are high, a specialist study is commissioned to understand and develop the mitigation measures. If after a specialist studies there are still further uncertainties pertaining the impact, a precaution measure is applied to allow for more studies to be undertaken.

Table 6. Criteria for impact assessment

| Risk Event | Rating | Description of the risk that may lead to an Impact |
|--|--|---|
| Impact type | 0 | No Impact |
| | +VE | Positive |
| | -VE | Negative |
| Probability | The probability that an impact may occur under the following analysis | |
| | 1 | Improbable (Low likelihood) |
| | 2 | Low probability |
| | 3 | Probable (Likely to occur) |
| | 4 | Highly Probable (Most likely) |
| | 5 | Definite (Impact will occur irrespective of the applied mitigation measure) |
| Confidence level | The confidence level of occurrence in the prediction, based on available knowledge | |
| | L | Low |
| | M | Medium |
| | H | High |
| Significance (Without Mitigation) | 0 | None (Based on the available information, the potential impact is found to not have a significant impact) |
| | L | Low (The presence of the impact's magnitude is expected to be temporal or localized, that may not require alteration to the operation of the project) |
| | M | Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require that the projects is altered to mitigate the impact or alternative method of mitigation is implemented) |
| | H | High (The impact is definite, can be regional or national and in long term. The impact could have a no go implication unless the project is re-designed or proper mitigation can practically be applied) |
| Mitigation | The applied measure / alternative to reduce / avoid an impact | |

| | | |
|---------------------------------------|--------------------------------------|---|
| | | |
| Significance (With Mitigation) | 0 | None (Based on the available information, the potential impact is found to not have a significant impact) |
| | L | Low (The presence of the impact's magnitude is expected to be temporal or localised, that may not require alteration to the operation of the project) |
| | M | Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require that the projects is altered to mitigate the impact or alternative method of mitigation is implemented) |
| | H | High (The impact is definite, can be regional or national and in long term. The impact could have a no go implication unless the project is re-designed or proper mitigation can practically be applied) |
| Duration | Time duration of the impacts | |
| | 1 | Immediate |
| | 2 | Short-term (0-5 years) |
| | 3 | Medium-term (5-15 years) |
| | 4 | Long-term (more than 15 years) |
| | 5 | Permanent |
| Scale | The geographical scale of the impact | |
| | 1 | Site specific |
| | 2 | Local |
| | 3 | Regional |
| | 4 | National |
| | 5 | International |

6.2. Impact risk assessment procedure

An illustration of an impact analysis is shown in Figure 7.

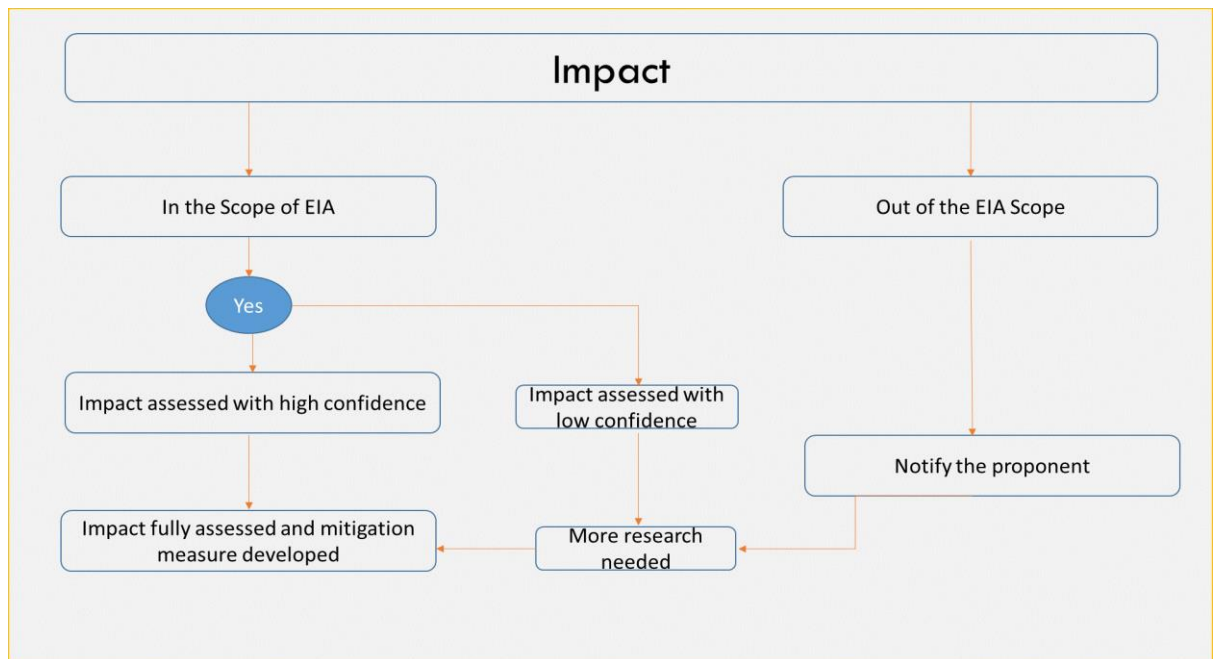


Figure 6. Matrix used for the assessment of impacts

Chapter 7

7. Risk assessment

7.1. Construction phase

7.1.1. Impact on bio-physical environment

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|--|----------------------------|---------------|
| <p>Flora</p> <p>The area is encroached by one species of Acacia Mellifera shrubs. There are not mature trees or protect trees</p> | <p>1. It is advisable to clear shrubs within the 2000m² where waste will be disposed</p> <p>2. Other shrubs within the fenced area may act as wind breakers and may only be removed during expansion.</p> | Type | -VE |
| | | Severity | Low |
| | | Scale / Extend | Site specific |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |
| <p>Fauna</p> | <p>1. Do not kill animal, unless such animals pose eminent danger to humans</p> | Type | -VE |
| | | Severity | Medium |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|---------------|
| There may be crawling animal in the area, such as snakes. | | Scale / Extend | Site specific |
| | | Probability | Possible |
| | | Confidence level | High |
| | | Without Mitigation | Medium |
| | | With Mitigation | Low |
| | | With Mitigation | Medium |
| Land Degradation The uncontrolled movement of heavy machinery at the project site may cause land degradation. There is an existing access road | 1. Movement of heavy vehicles must be coordinated and restricted to be on site and on access roads. | Type | -VE |
| | | Severity | Low |
| | | Scale / Extend | Site specific |
| | | Probability | Possible |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| With Mitigation | Low | | |
| | 1. Fueling of heavy vehicle on site must be | Type | -VE |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|--|----------------------------|---------------|
| <p>Land Pollution / Surface & Ground Water Pollution</p> <p>Heavy vehicle and machinery may pollute water sources from leakages of oils, hydraulic fluids, lubricants and greases. These pollutants may reach underground water through seepage. Additionally, surface water may be polluted from surface run off soils that is polluted.</p> | <p>well coordinated at designated places</p> <p>2. Stationary vehicles must be provided with drip tray to capture oil, lubricants and hydraulic fluids leakages</p> <p>3. All vehicle and machinery must be well serviced to avoid leakages</p> <p>4. Provide and train on oil spill emergency response</p> <p>5. Servicing of vehicles and machinery must take place at designated sites only</p> | Severity | Medium |
| | | Scale / Extend | Site Specific |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Medium |
| | | With Mitigation | Low |
| <p>Air Pollution</p> <p>It is inevitable that the movement of heavy vehicles loosen the top soil and makes it susceptible to wind erosion thereby causing dust pollution. Digging and excavation may produce large amount of dust. Furthermore, air pollution from vehicle exhaust is expected but minimal.</p> | <p>1. Movement of heavy vehicles must strictly be restricted within the site.</p> <p>2. Adhere to the minimum speed limit of 30 km/hour.</p> <p>3. Do not excavate during heavy winds.</p> <p>4. Trucks carrying sand must be covered.</p> <p>5. Excavated stock piles must be covered or regularly sprayed with water.</p> <p>6. On site where soil is loosened by vehicle movement, apply a dust suppression</p> | Type | -VE |
| | | Severity | Low |
| | | Scale / Extend | Site specific |
| | | Probability | Possible |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|---------------|
| | <p>method such as water spraying.</p> <p>7. Cement and concrete must be mixed with concrete mixers and not manually in the open.</p> <p>8. Workers must not be exposed to excess dust and should be provided with appropriate PPE such as dust masks and ear muffs.</p> <p>9. Adhere to the Labour Act which states that non-toxic human dust exposure levels may not exceed 5mg/m³ for respiratory dust and 15mg/m³ for total dust,</p> <p>10. Cement bags must be stored and disposed of properly and may not be shaken in the open</p> | | |
| <p>Waste Generation</p> <p>Waste generation shall include, general house hold waste, construction waste such as</p> | <ol style="list-style-type: none"> 1. Develop a waste management strategy 2. Provide skip bins to collect waste and be disposed of at an approved disposal site 3. Provide mobile toilets at the site 4. Do not burry waste on site | Type | -VE |
| | | Severity | Medium |
| | | Scale / Extend | Site specific |
| | | Probability | Definite |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|---------------|
| replaced parts, broken parts, packaging material and used empty utilities. | 5. Used oil, grease and lubricants cans must be collected in appropriate drums and disposed of at an approved site. | Confidence level | High |
| | | Without Mitigation | Medium |
| | | With Mitigation | Low |
| Noise Pollutions Noise from heavy vehicles may be a nuisance to animal in the farm. However, this is expected to be minimal, as animals are accustomed to human and vehicles movements. There are no surrounding neighbours that may be noise receptors. | 1. Heavy vehicles must be well serviced 2. Switch off engine for vehicles when not in use 3. Drive at 30/km while on site | Type | -VE |
| | | Severity | Low |
| | | Scale / Extend | Site specific |
| | | Probability | Possible |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |
| | | | |

7.1.2. Impact on human dimension

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|----------|
| <p>Employment</p> <p>Neudamm has a small community. There may be some un-employed people living with relatives employed on the farm. The contractor is advised to make use of the unemployed during the construction phase.</p> | <ol style="list-style-type: none"> 1. Ensure that all general work is reserved for local people unless in circumstances where specialized skills are required. 2. Fair compensation and labour practices as per the Namibian Labour Laws must be followed 3. Ensure all workers go through an induction course | Type | +VE |
| | | Severity | Medium |
| | | Scale / Extend | Local |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Medium |
| | | With Mitigation | Low |
| <p>HIV/AIDS, Alcohol and Drug abuse</p> <p>Namibia has high prevalence of HIV/AIDS and it is important to ensure that employees are sensitized about the pandemic.</p> | <ol style="list-style-type: none"> 1. Provide awareness to the employees / recyclers on the danger of alcohol and drug abuse 2. Provide awareness on HIV / AIDS and provide condoms on site | Type | -VE |
| | | Severity | High |
| | | Scale / Extend | Local |
| | | Probability | Probable |
| | | Confidence level | High |
| | | Without Mitigation | Medium, |
| | | With Mitigation | Low |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|----------|
| <p>Health and Safety</p> <p>The Regulations Relating to the Health and Safety of Employees at Work, made under Labour Act of 1992 (Act No. 6 of 1992) place legal duty on employers to provide a health and safe working environment to the employees and any person other than the employees who might be affected by their operations.</p> <p>Operation of specialized equipment may pose safety risk if not executed correctly</p> | <p>Health;</p> <ol style="list-style-type: none"> 1. Abide to the Occupational Health and Safety and Labour Act of Namibia and other statutory requirement such as International Labour Practise (ILO) 2. Ensure adequate first aid kit 3. Supervisors must undergo an occupational health and first aid course; 4. Train employees on the possible health hazards to avoid potential risks 5. Provide appropriate Personal Protective Equipment (PPE) 6. Employees must NOT be exposed to noise levels above the required -85dB (A) limit over a period of 8 hours. 7. Adhere to the Labour act, which states that, non-toxic human dust exposure levels may not exceed 5mg/m3 for | Type | -VE |
| | | Severity | High |
| | | Scale / Extend | Local |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | High |
| | | With Mitigation | Low |
| | | | |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|-------------------------------|--|----------------------------|--|
| | <p>respiratory dust and 15mg/m³ for total dust.</p> <p>8. Supply clean drinking water to the site;</p> <p>Safety</p> <p>9. Develop a safety plan</p> <p>10. Ensure that every employee goes through an induction course about safety;</p> <p>11. Employees must be equipped with all necessary Personal Protective Equipment (PPE) including helmets, overalls, safety shoes, safety glasses, gloves, earmuffs, etc.</p> <p>12. Only qualified and licensed personnel must be allowed to operate machinery and vehicles</p> <p>13. Adequate safety signs must be displayed on site</p> | | |

| Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|----------|
| <p>Archaeology</p> <p>There are no known possible heritage or archaeology materials on site</p> | <p>1. Implement a chance find and steps to be taken when archaeological material findings (heritage rock painting and drawings), human remains or artefacts) are unearthed Stopping the activity immediately:</p> <ul style="list-style-type: none"> i. Informing the operational manager or supervisor ii. Cordoning off the area with a danger tape and manager to take appropriate pictures. iii. Manager/supervisor must report the finding(s) to the National Museum (+ 264 61 276 800) or the National Forensic Laboratory (+ 264 61 240 461). | Type | -VE |
| | | Severity | Medium |
| | | Scale / Extend | Local |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Medium, |
| | | With Mitigation | Low |
| | | | |

7.2. Operational Phase

The operational impact analysis shall mainly focus on the Health and Safety risks from handling of waste, possible vermin and diseases as well as aesthetic impact as a result of waste management on site.

7.2.1. Impacts on Physical Environment

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|---------------|
| <p>Land Degradation</p> <p>During operation, land degradation is not expected. Vehicle taking waste to the site are expected to be on the access road. Furthermore, these are light pick up vehicles / small trucks that will not necessarily cause land degradation.</p> | <p>1. Vehicle accessing the site must use access road</p> | Type | -VE |
| | | Severity | Low |
| | | Scale / Extend | Site Specific |
| | | Probability | Possibly |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |
| <p>Visual impact</p> | <p>1. Color coded waste bins must be place at every waste</p> | Type | -VE |
| | | Severity | Low |

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|---|---|----------------------------|----------|
| <p>The most common impact associated with waste disposal sites is litter. Plastics and paper that are easily blown away by wind litters the surrounding of the waste disposal and becomes an eye shore. Further, uncoordinated waste disposal of waste can also become an eye shore, where cans and bottles are scattered all over the waste disposal site. To ensure a systematic management of visual impact, the following mitigation measures must be adopted and implemented</p> | <p>generating points;</p> <p>2. During waste disposal, leftover paper and plastic must be burned to ensure that they are not blown away by the wind, however emphasis is placed on recycling;</p> <p>3. Cans, bottles, glass and household appliances, broken plates, washing basin etc., must be disposed of in a coordinated manner (Recycling is recommended);</p> <p>4. Waste should be compacted when necessary.</p> | Scale / Extend | Local |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |
| <p>Surface and Ground Water Pollution</p> <p>Waste disposal sites are notoriously known for water pollution through run off and leachate.</p> | <p>1. Develop a waste management strategy with strong emphasis on Reduce, Re-Use, Re-Cycle</p> <p>2. Introduce oil leak prevention such as drip trays under</p> | Type | -VE |
| Severity | | Medium | |
| Scale / Extend | | Site specific | |
| Probability | | Possible | |

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|---|--|----------------------------|------|
| <p>Decomposed materials such as cans, batteries, electricity appliances and many other noxious materials find their way into water stream from surface run off when there is no proper storm water as well as into ground water through leachate. Large scale landfill, prevent leachate through the installation of lining materials and leachate drainage collection systems. For a relatively smaller scale waste disposal site such as this one, leachate is expected to be negligible. Furthermore, the use of heavy vehicle may result to oil leakage during construction, or oil spill during re-fuelling which may end up in water sources. To mitigate the effect of water pollution. This is a non-hazardous waste site, hence hazardous waste such as oil and lubricants cans must not be disposed at the site</p> | <p>stationary vehicles etc.</p> <p>3. The base layer must be compacted with 150mm course and fine silt to attain some level of impermeable</p> <p>4. Construct storm water system to prevent run of water from entering the site</p> | Confidence level | High |
| | | Without Mitigation | Low |
| | | With Mitigation | Low |
| Air Quality | <p>1. All stationary vehicle must be switched off</p> | Type | -VE |
| | | Severity | Low |

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|----------|
| <p>Waste disposal site are associated with the decomposition of organic material by bacteria that causes unpleased odours as well as smoke from burning of waste. While large scale landfill are known to emit methane, which is a noxious gas that contribute to global warming this will not apply to this waste disposal site. The magnitude of the waste to be disposed at the site is very minimal. Papers, plastic, broken furniture can be reduced by controlled burning once after two /three months. This translates into 4 times burning per year. This type of burning is not expected to contribute to global warming, nor will it be a nuisance to surrounding areas.</p> <p>Emission from vehicle is expected to be negligible</p> | <ol style="list-style-type: none"> 2. Ensure controlled burning. 3. When bad odors are detected, compaction must be carried out to cover decomposing waste 4. Avoid burning of waste during windy times which may cause nuisance smoke | Scale / Extend | Local |
| | | Probability | Definite |
| | | Confidence level | High |
| | | Without Mitigation | Medium, |
| | | With Mitigation | Low |
| <p>Noise Pollution</p> <p>The pick vehicle that will be transporting waste is not expected to produce noise.</p> | | Negligible | |

7.2.2. Impact on Biological Environment

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact |
|---|---|-----------------------------|
| <p>Flora</p> <p>The operation of the project is not expected to impact flora.</p> | <p>Negligible</p> | |
| <p>Fauna</p> <p>The operation of the project is not expected to impact on fauna, since the area shall be fenced off and animals shall not have access to the site.</p> | <p>1. No killing of any type of animal is allowed unless such animal pose danger to human health (e.g. snake)</p> | <p>Insignificant</p> |

7.2.3. Impact on Human Environment

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|---|--|----------------------------|---------------|
| <p>Health and safety</p> <p>The health of employees may be at risk during collecting and disposing of waste. Handling of waste which has broken glass and decomposing substances may be safety risk to employees. At site, employees may be exposed to vermis and insect bite, bad odours and fire risk.</p> | <ol style="list-style-type: none"> 1. Control waste burning 2. Ensure compaction of waste as soon as bad odours appears or decomposition is seen that may cause vermin and diseases 3. Provide employees with adequate PPE 4. Only employees with driver license must be permitted to operate vehicles 5. Avoid waste compaction during extreme windy condition | Type | -VE |
| | | Severity | Medium |
| | | Scale / Extend | Site specific |
| | | Probability | Probable |
| | | Confidence level | High |
| | | Without Mitigation | Medium |
| | | With Mitigation | Low. |
| <p>HIV/AIDS, Alcohol and Drug Abuse</p> <p>Namibia has high prevalence of HIV/AIDS and it is important to ensure that employees are sensitized about the pandemic.</p> | <ol style="list-style-type: none"> 1. Provide awareness to the employees / recyclers on the danger of alcohol and drug abuse 2. Provide condoms on site | Severity | -VE |
| | | Scale / Extend | National |
| | | Probability | Probable |
| | | Confidence level | High |
| | | Without Mitigation | Medium |

| Potential Environmental / Social Impact | Mitigation Measures | Significance of the Impact | |
|--|---|----------------------------|-----|
| | | With Mitigation | Low |
| <p>Employment</p> <p>The already employed UNAM personnel will be responsible for waste disposal management of the waste site. Hence during operation, minimal employment is envisioned.</p> | Apply same principle as during construction phase | | |
| <p>Archaeology Heritage</p> <p>There are no known of possible heritage or archaeology materials on site</p> | Apply same principle as | | |

7.3. Environmental Management Plan

The Environmental Management Plan is attached. This Environmental Management Plan (EMP) is a risk strategy that contains logical framework, monitoring programme, mitigation measures, and management control strategies to minimize environmental impacts to be implemented during the project phases. It further stipulates the roles and responsibility of persons involved in the project.

Chapter 8

8. Conclusion and Recommendations

8.1. Conclusion

The proposed waste site shall cater for less than 40 people, with lessor people during holiday hence minimal waste production. Hazardous waste shall not be disposed of at the site. Leachate is not expected. The lifespan analysis showed that, the amount of waste that has been produced at the experimental farm is small owing to the fact that the current site has been in existence for over 50 years and the footprint has never been expanded. In comparison to the planned site which is relatively bigger, it is estimated that the proposed lifespan for the new site will be over about 100 years. With adequate implementation of the EMP, the site is not expected to pose threat to the environment.

8.2. Recommendations

This study recommends;

- The issuance of the Environmental Clearance Certificate for the proposed site to ensure closure of the existing site that is located on the edge of the river;
- UNAM undertake biannual environmental auditing to monitor the environmental performance in relation to the waste site;
- Adequate implementation of the mitigation measures / EMP.

Chapter 9

9. References and Appendixes

9.1. References

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