APP-003663

ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED ESTABLISHMENT OF A FLEXIBLE LAND TENURE SCHEME FOR DONKERHOEK (ERVEN 1205-1270) AND OMBILI (ERVEN 1150-1190) AIMABLAAGTE, TAKARANIA (240-504 EMPELHEIM EXT 3), EMPELHEIM EXT 5 TOWNSHIP ESTABLISHMENTS IN MARIENTAL, HARDAP REGION

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GLOSSARY OF TERMS

Project area - Refers to the entire study area encompassing the total area as indicated on the study area map.

Project site - Refers to the geographical setting (piece of land) on which the proposed development is to be located.

Assessment - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

Proponent (Applicant) – means a person who intends or undertakes a project, policy, programme or plan.

Significant Impact - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Sewage - Sewage is water-carried waste, in solution or suspension, which is intended to be removed from a community.

Environmental Clearance Certificate - This Certificate obtained from the Ministry of Environment and Tourism (Directorate of Environmental Affairs) approving the EIA study and providing clearance to the proponent to initiate work.

Alternatives - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The "no-go" alternative constitutes the 'without project' option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

Cumulative Impacts - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Evaluation – means the process of ascertaining the relative importance or significance of information, the light of people's values, preference and judgements in order to make a decision.

Environment – As defined in the Environmental Policy and Environmental Management Bill of Namibia - "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values".

Environmental Impact Assessment (EIA) – process of assessment of the effects of a development on the environment.

Environmental Management Plan (EMP) - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

Environmental Clearance Certificate - This Certificate obtained from the Ministry of Environment and Tourism (Directorate of Environmental Affairs) approving the EIA study and providing clearance to the proponent to initiate work.

Environmental Assessment Practitioner - A person designated by a proponent to manage the assessment process.

Hazard - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

Interested and Affected Party (I&AP) - any person, group of persons or organization interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Proponent (Applicant) – means a person who intends or undertakes a project, policy, programme or plan.

Significant Impact - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Sustainable Development - "Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations" – the definition of the World Commission on Environment and Development (1987). "Improving the quality of human life while living within the carrying capacity of supporting ecosystems" – the definition given in a publication called "Caring for the Earth: A Strategy for Sustainable Living" by the World Conservation Union (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

Interested and Affected Party (I&AP) - any person, group of persons or organization interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

1. BACKGROUND AND INTRODUCTION

Mariental Municipality, in conjunction with the Ministry of Agriculture, Water and Land Reform (MAWLR) has commissioned an Environmental Impact Assessment (EIA) for the establishment of a Flexible Land Tenure Scheme for township developments in Mariental, Hardap Region.

The Flexible Land Tenure System (FLTS) is a system for land registration. It regulates the surveying and registration of land rights to contribute to providing tenure security for the urban poor living in informal settlements. The system does not regulate the town planning aspects, which need to take place before a settlement can be surveyed and land rights registered. But for Flexible Land Tenure Schemes to function and for registration to go smoothly, town planning needs to take certain aspects for the FLTS into consideration. This guide outlines these aspects and makes recommendations how town planning can contribute to a smooth implementation of the FLTS.

Kamau Town Planning & Development Specialist, in collaboration with Matrix Consulting Services was appointed to undertake the Environmental Impact Assessment of the proposed development. This study will enable decision makers to make an informed decision regarding the development and make sure it does not have significant impacts on the environment and that they are mitigated. The environmental scoping assessment was conducted to comply with Namibia's Environmental Assessment Policy and the Environmental Management Act.

1.1. Project Rationale

The town of Mariental is currently experiencing a scarcity of developable land for residential purposes and therefore initiated this project to develop (service) land in some identified urban areas of Mariental. The need for the project relate to the strategic plans of the town to avail serviced residential ervens.

The proposed project will provide residential to general residential, business, municipal, institutional, undetermined ervens, streets and public open spaces. Other associated land uses of the establishment are related to provision of bulk services. The development will therefore not only benefit the future occupants but also the surrounding areas by providing necessary facilities, potential jobs and social services that are not currently in place

The proposed development of the site is desirable from the perspective of availability and proximity of engineering bulk services, compatibility with adjacent projects, accessibility, size and locality. The proposed development will also create employment, both during the construction and operational phase.

Potential spin-offs:

- Reduced serviced land scarcity in Mariental.
- Creation of job opportunities, training and skills development during construction and operational phase.
- It is estimated that the new jobs will improve the livelihoods of the workers and their families.

- ❖ Given that the unemployment rate of 41.9% in the region, this in itself is regarded as a significant benefit to the socio-economic situation in the region (2018, Namibia Labour Force Survey, Hardap Region).
- ❖ Provision of housing and community facilities.
- ❖ Impact on health and safety of residents by developing the scheme.
- ❖ Change the sense of the place of the area from informal and undeveloped townland to formal townland.
- ❖ Increase in economic opportunities in the area.
- ❖ General enhancement of the quality of life at the town and region at large, should the project be economically viable.

1.2. Location and Land Use

The project location (24.64071°S; 17.97597°E) is situated within the Mariental townlands, in the Hardap Region. See Figure 1. Mariental is situated along the B1 road, 232 km north of Keetmanshoop and 274 km southeast of the national capital Windhoek. The town lies at an elevation of 1,090 metres above sea level (masl).

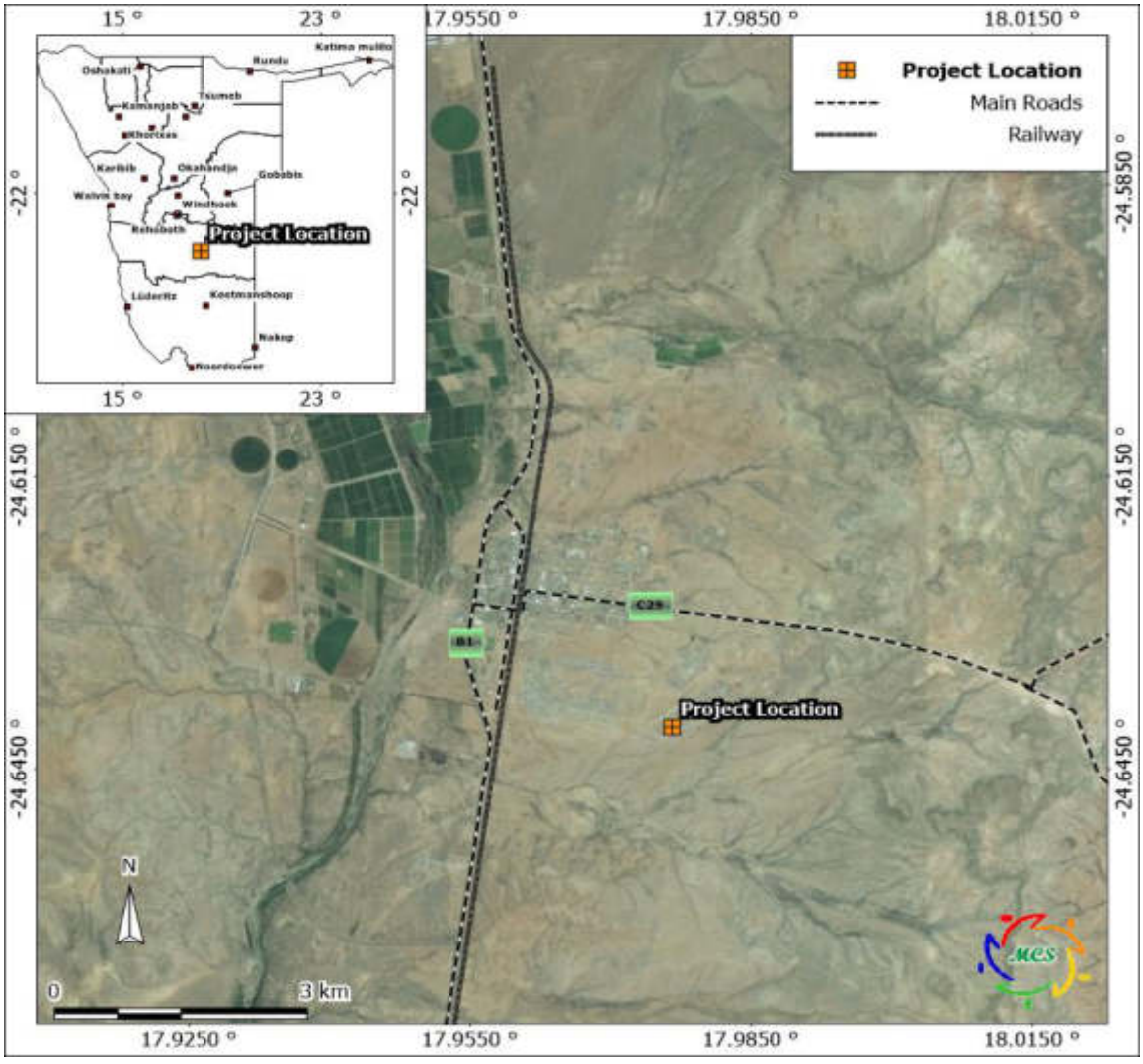


Figure 1. Project location (24.64071°S; 17.97597°E)

1.3. Project Phases

The project is made up of 3 phases, namely the construction, operation and possible decommissioning phase. Activities involved in all phases are as follows:

Construction Phase:

- Site preparation and/or land clearance.
- Transporting relevant building material and equipment.
- Installation of associated electrical supply cables.
- Installation of associated water pipelines.
- Installation of associated sewer lines.
- Installation of storm water management system
- Roads construction.
- Progressive rehabilitation.

Operational Phase:

- Operation and maintenance of the sewer, water, electrical services and roads.

Decommissioning Phase:

- Removal of all infrastructure not reused during future use of land; and
- Rehabilitation of the land.

2. TERMS OF REFERENCE

Mariental Municipality / MAWLR have commissioned an Environmental Impact Assessment (**EIA**) for the establishment of a Flexible Land Tenure Scheme in Mariental, Hardap Region.

Kamau Town Planning & Development Specialist, in collaboration with Matrix Consulting Services was appointed to undertake the Environmental Impact Assessment of the proposed scheme development. This study will enable decision makers to make an informed decision regarding the development and make sure it does not have significant impacts and that they are mitigated. The environmental impact assessment was conducted to comply with the Environmental Assessment Policy (1995) and the Environmental Management Act (2007) and its regulations of 2012.

3. ENVIRONMENTAL STUDY REQUIREMENTS

According to the Environmental Management Act no. 7 of 2007, the proponent requires an environmental clearance from the Ministry of Environment and Tourism (Department of Environmental Affairs) to undertake activities relating to the proposed scheme establishment. The certificate means that the Ministry of

Environment and Tourism is satisfied that the activity in question will not have an unduly negative impact on the environment. It may set conditions for the activity to prevent or to minimise harmful impacts on the environment.

The proposed development is listed as a project requiring an environmental assessment as per the following listed activities in the Environmental Management Act no 7 of 2007 and its Guidelines (06 February 2012):

Table 1. List of activities identified in the EIA Regulations which apply to the proposed project

Activity Description:	Description of Activity	Activities
Activity 5.1 (d) Land Use and Development Activities	The rezoning of land from – use for nature conservation or zoned open space to any other land use.	The project will be located on open land that is currently vacant and not utilised.
Activity 8.9 Water Resource Developments	The construction and other activities within a catchment area.	The project entails activities that will be undertaken within the Fish River catchment area.
Activity 10.1 (a) (Infrastructure)	The construction of – Oil, water, gas and petrochemical and other bulk supply pipelines.	The proposed project includes the installation of bulk municipal services
Activity 10.1 (b) (Infrastructure)	The construction of – Public roads.	The proposed project includes the construction of roads.
Activity 10.2 (a) (Infrastructure)	The route determination of roads and design of associated physical infrastructure where – it is a public road;	The proposed project includes the construction of roads.

4. DESCRIPTION OF ALTERNATIVES

4.1 No-Go Alternative

The no-development alternative is the option of not establishing the proposed land tenure scheme at the town. The no-go alternative will keep the identified land in its current state; and the community will thus be deprived of the benefits of the proposed tenure system and its associated services to be installed. This alternative is undesirable in terms of the existing informal and un-serviced land at the town. The alternative will deprive the town and region at large of the much needed development, which ultimately addresses serviced land scarcity. The No-go option will not be a viable alternative at this stage.

4.2 Site Alternative

The project areas are generally ideal for scheme establishment as all existing surrounding land use is residential. The area is in close proximity to existing engineering services which has capacity to support the development.

The environmental footprint is expected to be minimal as the project site is already disturbed. The land to be developed is owned by the Mariental Municipality, which intends to provide serviced formal land to its inhabitants, in order to address the scarcity of serviced land at the town. Potential impacts of the development, both environmental and socio-economic can be mitigated through good practice and compliance to the EMP.

5. SCOPE

The scope of the EIA aims at identifying and evaluating potential environmental impacts emanating from the construction, operations and possible decommissioning of the proposed development. Relevant data have been compiled by making use of secondary sources and from project site visits. Potential environmental impacts and associated social impacts will be identified and addressed in this report.

The environmental impact assessment report aims to address the following:

a) Identification of potential positive and negative environmental impacts.

b) Provide sufficient information to determine if the proposed project will result in significant adverse impacts.

c) Identification of "hotspots" which should be avoided where possible due to the significance of impacts.

d) Evaluation of the nature and extent of potential environmental impacts

e) Identify a range of management actions which could mitigate the potential adverse impacts to required levels.

f) Provide sufficient information to the Ministry of Environment to make an informed decision regarding the proposed project.

g) Conduct a public participation exercise.

h) Present and incorporate comments made by stakeholders.

6. METHODOLOGY

The following methods were used to investigate the potential impacts on the social and natural environment due to the construction and operation of the development:

a) Information about the site and its surroundings was obtained from existing secondary information and site visits.

b) Neighbours, interested and affected Parties (I&APs) were consulted and their views, comments and opinions are presented in this report.

7. STATUTORY REQUIREMENTS

The EIA process is undertaken in terms of Namibia's Environmental Management act no. 7 of 2007 and the Environmental Assessment Policy of 1995, which stipulates activities that may have significant impacts on the environment. Listed activities require the authorisation from the Ministry of Environment and Tourism (DEA). Section 32 of the Environmental Management Act requires that an application for an environmental clearance certificate be made for the listed activities. The following environmental legislation is relevant to this project:

I. The Namibian Constitution

The Namibian Constitution has a section on principles of state policy. These principles cannot be enforced by the courts in the same way as other sections of the Constitution. But they are intended to guide the Government in making laws which can be enforced.

The Constitution clearly indicates that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at management of ecosystems, essential ecological processes and biological diversity of Namibia for the benefit of all Namibians, both present and future.

II. Environmental Management Act No.7 of 2007

This Act provides a list of projects requiring an Environmental assessment. It aims to promote the sustainable management of the environment and the use of natural resources and to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.

The Act defines the term "*environment*" as an interconnected system of natural and human-made elements such as land, water and air; all living organisms and matter arising from nature, cultural, historical, artistic, economic and social heritage and values.

The Environmental Management Act has three main purposes:

(a) to make sure that people consider the impact of activities on the environment carefully and in good time

(b) to make sure that all interested or affected people have a chance to participate in environmental assessments

(c) to make sure that the findings of environmental assessments are considered before any decisions are made about activities which might affect the environment.

Line Ministry: Ministry of Environment and Tourism

III. The Water Act (Act No 54 of 1956)

The Water Act No. 54 of 1956 as amended, aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users.

The Act broadly controls the use and conservation of water for domestic, agricultural, urban and industrial purposes; to control, in certain respects, the use of sea water; to control certain activities on or in water in certain areas; and to control activities which may alter the natural occurrence of certain types of atmospheric precipitation.

IV. Water Resources Management Act of Namibia (2004) *(Guideline only)*

This act repealed the existing South African Water Act No.54 of 1956 which was used by Namibia. This Act ensures that Namibia's water resources are managed, developed, protected, conserved and used in ways which are consistent with fundamental principles depicted in section 3 of this Act. Part IX regulates the control and protection of groundwater resources. Part XI, titled Water Pollution Control, regulates discharge of effluent by permit.

Line Ministry: Ministry of Agriculture, Water Affairs and Forestry

V. Environmental Assessment Policy of Namibia (1995)

Environmental Assessments (EA's) seek to ensure that the environmental consequences of development projects and policies are considered, understood and incorporated into the planning process, and that the term ENVIRONMENT (in the context of IEM and EA's) is broadly interpreted to include biophysical, social, economic, cultural, historical and political components.

All listed policies, programmes and projects, whether initiated by the government or the private sector, should be subjected to the established EA procedure as set out in Figure 2.

Line Ministry: Ministry of Environment and Tourism

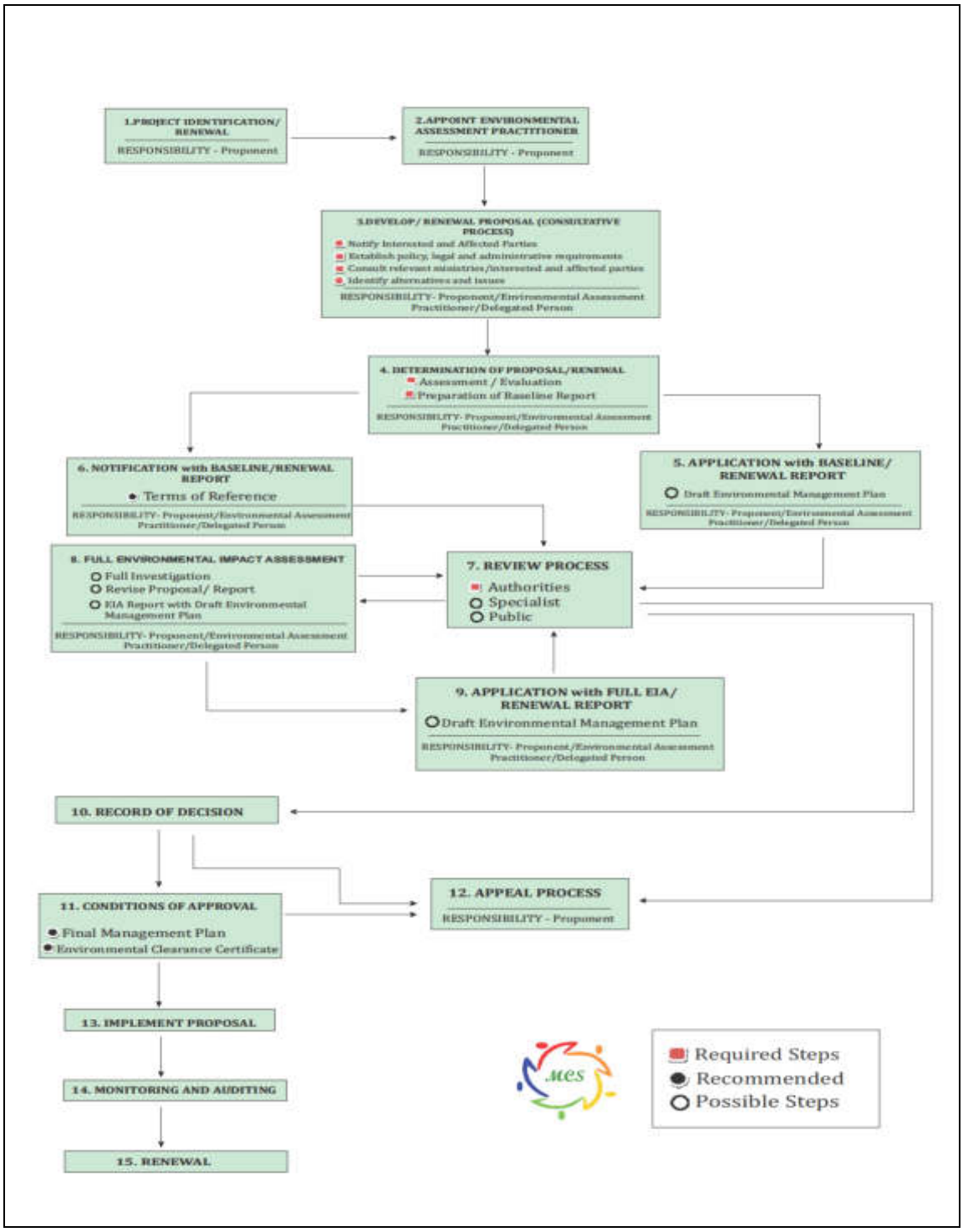


Figure 2. Environmental Assessment Procedure of Namibia *(Adapted from the Environmental Assessment Policy of 1995)*

Apart from the requirements of the Environmental Assessment Policy, the following sustainability principles needs to be taken into consideration, particularly to achieve proper waste management and pollution control:

✓ **Cradle to Grave Responsibility**

This principle provides that those who manufacture potentially harmful products should be liable for their safe production, use and disposal and that

those who initiate potentially polluting activities should be liable for their commissioning, operation and decommissioning.

- ✓ **Precautionary Principle**

There are numerous versions of the precautionary principle. At its simplest it provides that if there is any doubt about the effects of a potentially polluting activity, a cautious approach should be adopted.

- ✓ **The Polluter Pays Principle**

A person who generates waste or causes pollution should, in theory, pay the full costs of its treatment or of the harm, which it causes to the environment.

- ✓ **Public Participation and Access to Information**

In the context of environmental management, citizens should have access to information and the right to participate in decisions making.

VI. Draft Pollution Control and Waste Management Bill *(Guideline only)*

The proposed development, only applies to Parts 2, 7 and 8 of the Bill.

Part 2 stipulates that no person shall discharge or cause to be discharged any pollutant to the air from a process except under and in accordance with the provisions of an air pollution licence issued under section 23. It further provides for procedures to be followed in licence application, fees to be paid and required terms of conditions for air pollution licences.

Part 7 states that any person who sells, stores, transports or uses any hazardous substances or products containing hazardous substances shall notify the competent authority, in accordance with sub-section (2), of the presence and quantity of those substances.

Part 8 calls for emergency preparedness by the person handling hazardous substances, through emergency response plans.

VII. Atmospheric Pollution Prevention Ordinance of Namibia (No. 11 of 1976)

The Ordinance prohibits anyone from carrying on a scheduled process without a registration certificate in a controlled area. A certificate must be issued if it can be demonstrated that the best practical means are being adopted for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process. Best practice would be to notify the line Ministry about emissions but it is not a legal requirement.

Line Ministry: Ministry of Health and Social Services

VIII. 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 and is administered by the Minister of Health and Social Welfare. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings.

Line Ministry: Ministry of Health and Social Services

IX. Atmospheric Pollution Prevention Ordinance of Namibia (No. 11 of 1976)

The Ordinance prohibits anyone from carrying on a scheduled process without a registration certificate in a controlled area. A certificate must be issued if it can be demonstrated that the best practical means are being adopted for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process. Best practice would be to notify the line Ministry about emissions but it is not a legal requirement.

Line Ministry: Ministry of Health and Social Services

X. Soil Conservation Act (No.76 of 1969)

The Act advocates for the prevention and combating of soil erosion, conservation, improvement and manner of use of soil and vegetation, and protection of water resources.

XI. Public Health Act 36 of 1919 and Subsequent Amendments

The Act, with emphasis to Section 119 prohibits the presence of nuisance on any land occupied. The term nuisance for the purpose of this ESA is specifically relevant specified, where relevant in Section 122 as follows:

- ✓ any dwelling or premises which is or are of such construction as to be injurious or dangerous to health or which is or are liable to favour the spread of any infectious disease;
- ✓ any area of land kept or permitted to remain in such a state as to be offensive, or liable to cause any infectious, communicable or preventable disease or injury or danger to health; or
- ✓ any other condition whatever which is offensive, injurious or dangerous to health.
- ✓ Potential impacts associated with the upgrade and operations are expected to include dust, air quality impacts, noise nuisance and smoke emissions.

Line Ministry: Ministry of Health and Social Services

XII. Townships and Division of Land Amendment Act (No.28 of 1992

Article (l) of this Act stipulates that "Whenever any area of land constitutes, by reason of its situation, a portion of an approved township, or adjoins an approved township, the Executive Committee may, by proclamation notice in the Gazette and after consultation with the Board, extend the boundaries of the township to include such an area". Thus the new township needs to be approved by the Namibian Planning Advisory Board and the Townships Board.

Line Ministry: Ministry of Regional and Local Government, Housing and Rural Development

XIII. Sewerage and Drainage Regulations (amendments) Local authorities act, section 23 (1992).

The regulations make provision for proper construction of pipelines in drainage lines. The regulations also stipulate the prevention of pollution and environmental damage caused by improper construction of sewerage and water pipelines in drainage lines.

Line Ministry: Ministry of Regional and Local Government, Housing and Rural Development

8. PROPOSED DEVELOPMENT

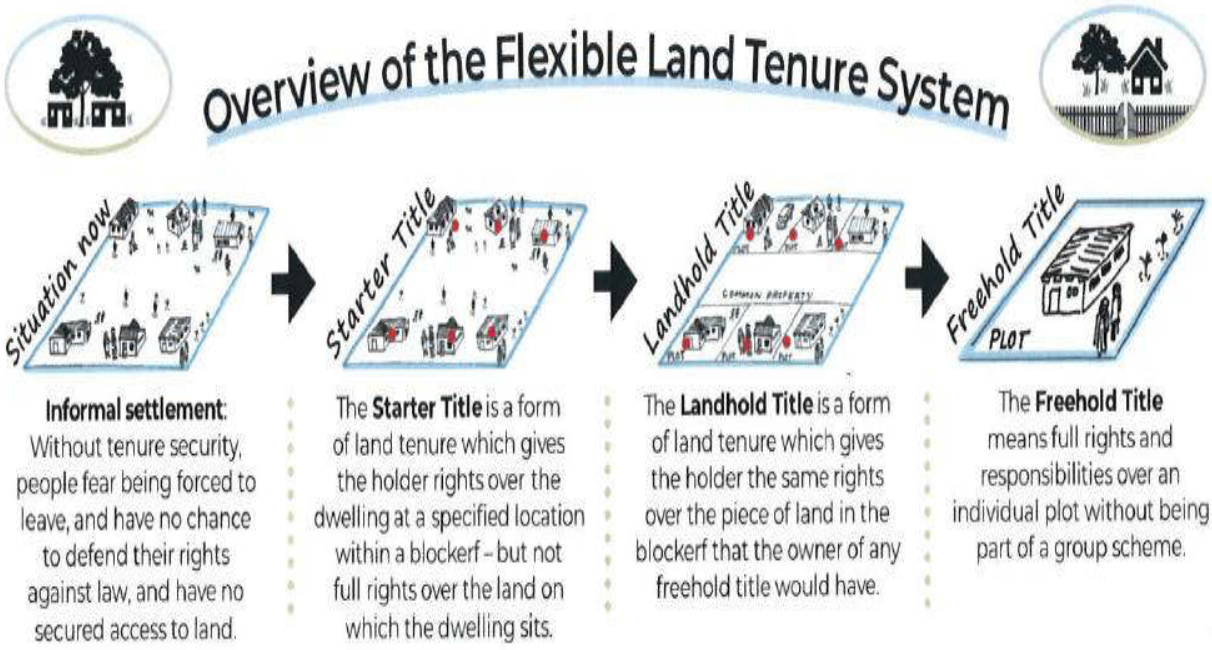
8.2 Flexible Land Tenure Process

The Flexible Land Tenure Act (FLTA) was passed in 2012, and the Regulations were published in 2018. The FLTS was born from a need for a land delivery system that can make security of tenure affordable to those living in informal settlements around the country. Thus, the FLTS is intended to function largely in parallel to existing legislation with the surveying and registration of land administered through a Land Rights Office.

The basis for all Flexible Land Tenure Schemes is the creation of a blockerf, depicting the outside boundaries of a settlement. Within the blockerf the system allows the creation of starter or land hold schemes.

The Flexible Land Tenure Act, 2012 (Act No.4 of 2012), creates new tenure system for land in urban areas by establishing two new forms of land title:

A. Starter Title
B. Land Hold Title



Starter Title Rights

- Erect and occupy a dwelling at a specified location of a specified size and nature of the scheme
- Transfer, bequeathed and leased titles to another person
- Upgrade to land hold or free hold title
- Cannot be used as collateral
- Not more than one starter right can be held

Land Hold Title Rights

- The same rights in the designated plot as the owner of an erf (freehold)
- Transfer, bequeathed and leased titles to another person
- Use title as collateral for a mortgage
- Upgraded to freehold
- One person can hold multiple land hold rights but implementation policy: one holder - one plot

8.3 Mariental Flexible Land Tenure Scheme

Mariental Municipality / MAWLR, hereafter referred to as the proponent is of the intention to establish Flexible Land Tenure Schemes for the following identified areas:

- **Donkerhoek (Erven 1205-1270 Aimablaagte)**
- **Ombili (Erven 1150-1190 Aimablaagte)**
- **Takarania (Erven 240-504 Empelheim Extension 3)**
- **Empelheim Extension 5**

Description of Identified Areas (See Appendix E for locality layout designs)

1. **Donkerhoek (Erven 1205-1270 Aimablaagte)**
   - The area has been surveyed and serviced;
   - The area is still to be registered.

2. **Ombili (Erven 1150-1190 Aimablaagte)**
   - The area has been surveyed and serviced;
   - The area is still to be registered.

3. **Takarania (Erven 240-504 Empelheim Extension 3)**
   - The area has been surveyed and serviced;
   - The area is still to be registered;
   - The area is currently being formalized and registered.

4. **Empelheim Extension 5**
   - The area is a Greenfield area, as approved by the Town Board;
   - The Council intents on creating a new layout plan and establishing smaller ervens for households in the area.

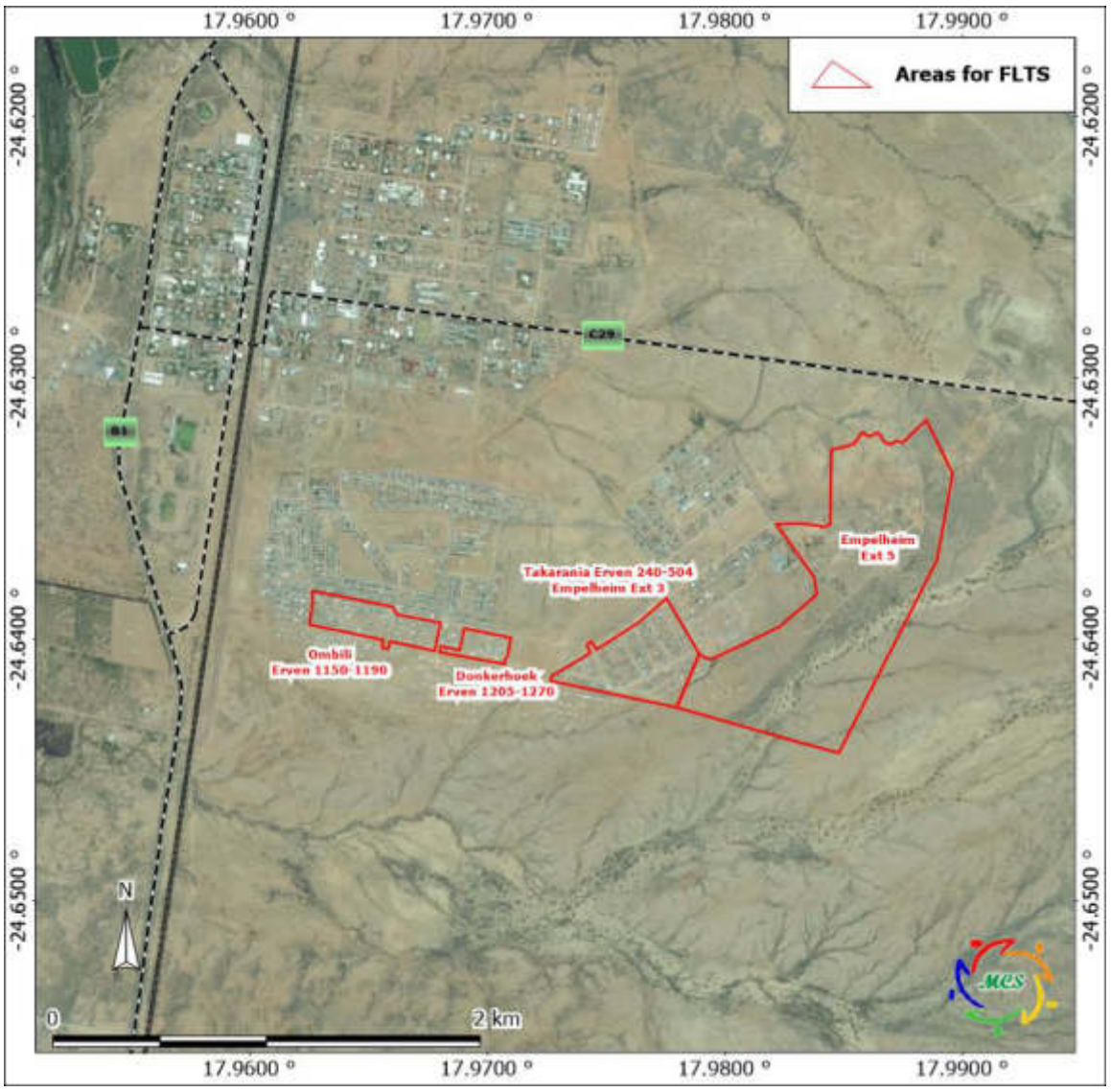


Figure 3. Locality of Areas Identified

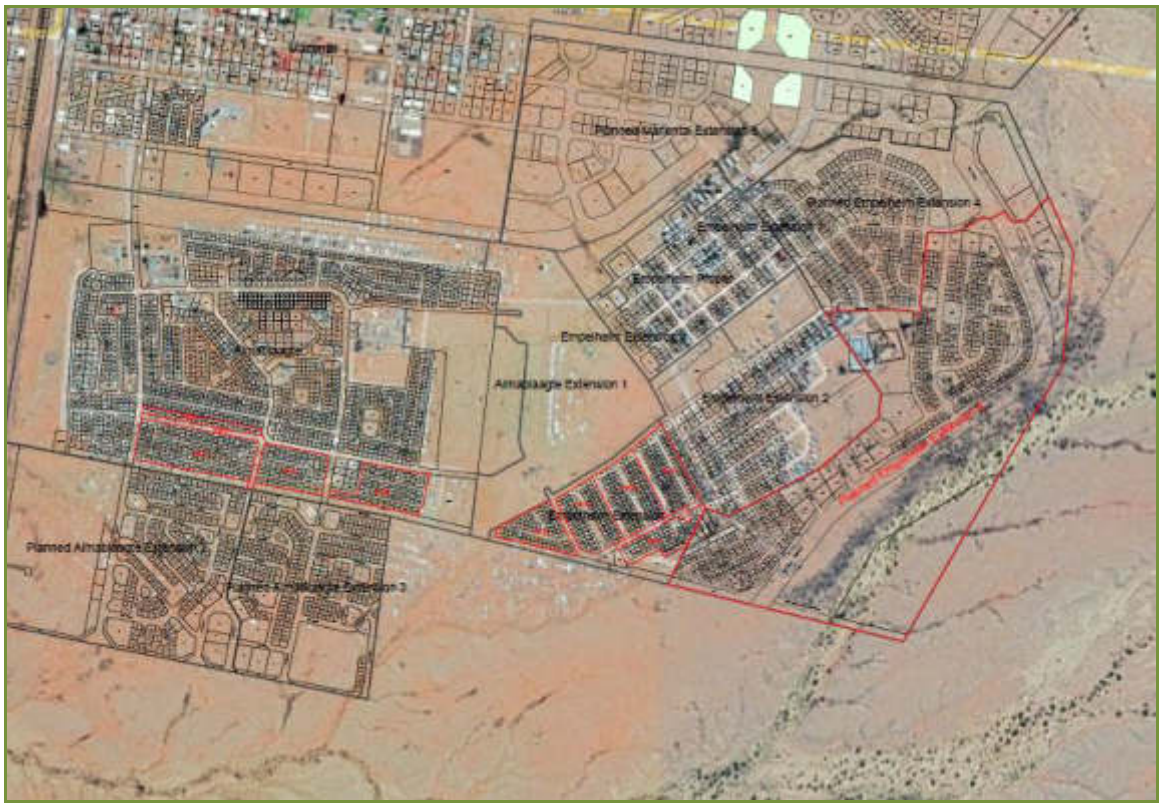


Figure 4. Proposed Township Plans

9. GENERAL ENVIRONMENT OF THE STUDY AREA

This section lists the most important environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

9.1 Climate *(Mandelsohn et al, 2003)*

Average rainfall:	Rainfall in the area is averaged between 200 to 250mm per year
Average evaporation:	Evaporation in the area is averaged to be between 2100 to 2400mm per year.
Precipitation:	Irregular and highly strong and localized storm events between October and April do occur.
Water Deficit:	Water deficit in the area is averaged to be between 2100 and 2300mm/a
Temperatures:	The hot season lasts for 3.6 months, from November 11 to February 28, with an average daily high temperature above 34.4°C. The hottest day of the year is December 26, with an average high of 37.2°C and low of 22.2°C.

	The cool season lasts for 2.5 months, from May 26 to August 11, with an average daily high temperature below 26.1°C. The coldest day of the year is July 12, with an average low of 5°C and high of 23.9°C.
Wind direction:	Wind direction in the area is predominantly northerly.

The Mariental area and its surroundings can be classified as a water deficit area with annual evaporations exceeding the mean annual rainfall by far. The aridity of the region causes the water resource to be a scarce commodity and has to be conserved and protected from pollution at all cost.

9.2 Topography and Surface Water

The Nama Karoo basin falls within a large, flat lying plateau that dominates most of Southern Namibia. Sedimentary rocks form the foundation of the landscape. The Fish, Lowen and Konkiep rivers drain the landscape, all flowing south towards the Orange River. The Fish River is situated approximately 2km west of the site.

Local drainage from the proposed township developments will flow westward towards the Fish River. The relief of small drainage systems are present and well defined in the area, which promotes good surface run-off in the area.

Site specific drainage systems should however be developed at the site to control the flow of surface water at the site to avoid flooding (e.g. erection of culverts). A storm water management system should form part of the engineering designs.

9.2.1 Fish River Flood Risk Assessment

According to the Fish River Flood and Hydrological Report (DHI, 2015), the maximum water depth and water velocity for each return period was used to calculate the flood hazard caused by flood events with the probability of occurrence of 1 in 5, 10, 20, 50 and 100 years. Flood hazard is highest when the water depth/velocity combination is also highest, as expected this corresponds to the river channels for all return periods shown in orange and red.

Flood vulnerability was determined by combining physical, economic and social indicators and attributing weights which determines their relevance. In order to quantify these indicators, census data was used, Google Earth imagery was analysed, and GIS calculations were carried out.

Determined by the weighted overlay of the overall flood hazard estimate, the weighted sum of the flood hazard for each event, and the vulnerability estimate achieved. From the equal weighted intersection of these two parameters, a corresponding risk category was calculated.

The results indicate a clear distinction between the Hardap irrigation scheme and the urban areas. The results from this assessment indicate where priority action should take place in the study area in terms of implementing flood protection plans.

A priority area for intervention is the risk zone of Mariental town between the B1 road and the railway line; Agricultural fields close to the Aub Bridge, the pivot fields

and adjacent fields by Maltahohe Bridge. The proposed township establishments are located within a low flood risk area, as per flood risk assessment results conducted in 2015. See Figure 5 below.

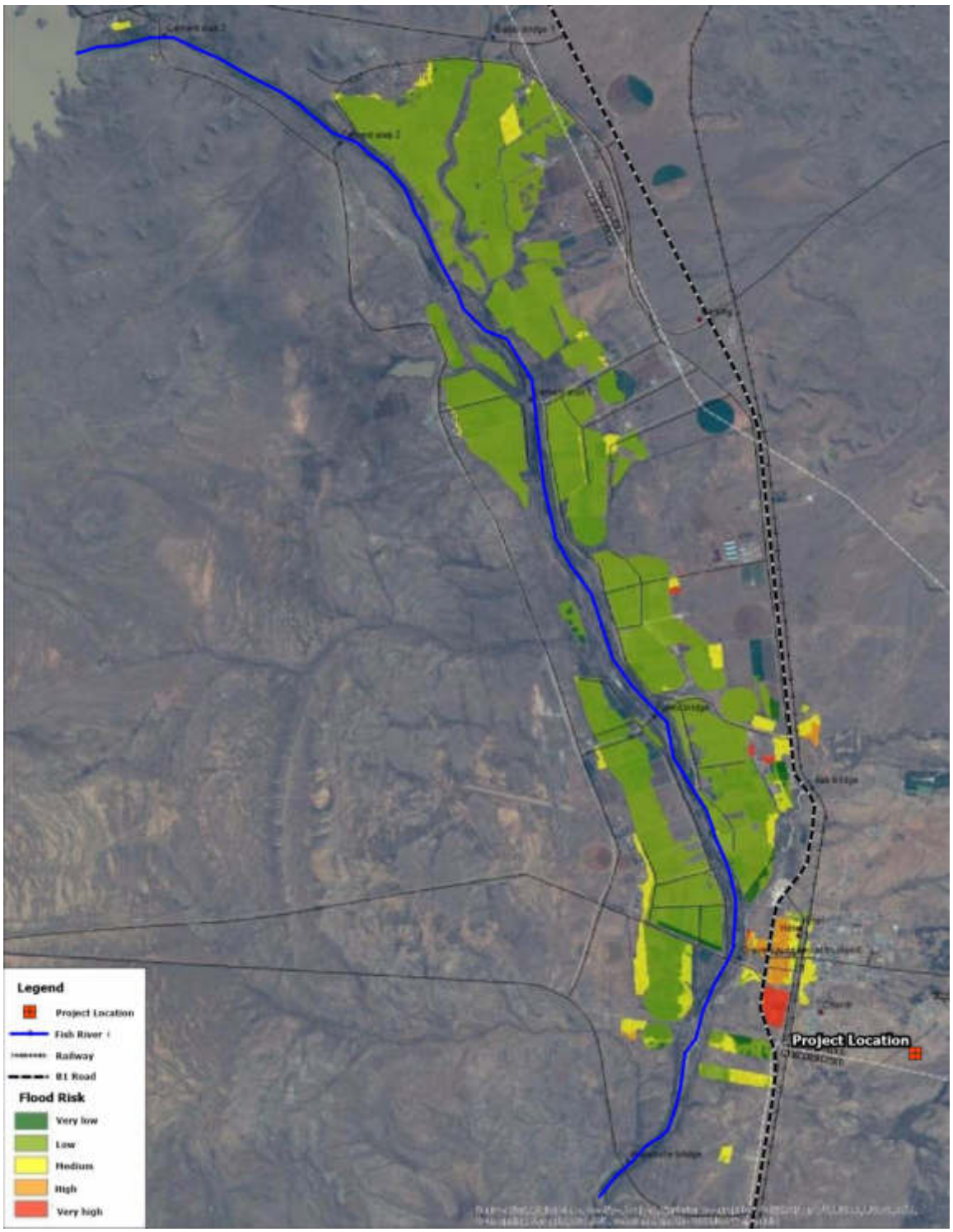


Figure 5. Flood risk assessment results for the area (DHI, 2015)

9.3 Geology *and Hydrogeology*

The geology of Fish River Basin consists of flat lying Nama sediments, Namaqua Metamorphic Complex rocks, Quaternary calcretic and conglomerate deposits. The

oldest units belong to the Namaqua Metamorphic Complex (NMC); they were deposited about 1800 millions years.

Some 770 million years ago, the metamorphic units (amphibolites, schists and granulite) were swarmed by dark mafic dolerite dykes that are quite prominent in the NE areas of Gibeon. Due to tectonic uplift and erosion over the years the Namaqua rocks were exposed further into lift grabens resulting into formation of a shallow sea. Within this sea the shales, siltstones, limestones and sandstones of the Nama Group where deposited. The original sediments are believed to have originated from the northern Damara Orogen, after their deposition no major metamorphic and deformation occurred. Thus to this day the Nama rocks preserve the spectacular horizontal structures and forming the sharp plateau geomorphology with Namaqua rocks. Moreover, some 350 Ma modern erosion formed large valleys and depressions.

During the Dwyka glaciations stage the valleys and grabens where widened deeper by southwards flowing rivers, forming the Karoo Sequence. The canyon present today was formed during post-Karoo times, during this time severe erosion removed most of the Karoo units, preserving the NMC and some Nama units. Quaternary calcretes are deposited more easterly of Mariental giving a more flat lying morphology.

West of Mariental, geomorphology is less plateaus like but depicts an undulating mountainous terrain. Within the valleys of the Mariental Fish River, the geomorphology (30km radius) is rather flat and rising higher in the western, eastern and northern directions.

From a hydrogeological perspective, it is quite difficult to find primary groundwater aquifers, unless of very recent river sediments. In and around Mariental town the main aquifer is the recent surficial sedimentary overburden that have accumulated over time, this could be ± 10m deep before bed rock. It is known that the water table in the town vicinity has risen up by 1.8m due to over grow of organic material.

The dominant aquifers are the secondary aquifers of the Nama and Karoo sediments that have been structurally faulted and jointed to form storage volumes for water. Springs are also common which are as a result of groundwater rising in major fault zones forming an artesian aquifer (water table/potentiometric surface above ground surface). In areas where erosion has incised till undeformed units of the Namaqua Complex and Namaqua rocks it may be quite difficult to find any water within these rocks. This is a very common event in the south-western and western areas of Mariental. High evaporation events have affected the groundwater quality mostly in the south and eastern areas of the Mariental district.

The water supply to Mariental is supplied by Namwater and is sourced from the Hardap Dam, situated approximately 18km northwest of Mariental. Subsurface water in the area is utilized with 4 boreholes known to exist within a 3km radius of the sites. Boreholes present in the area utilised for both domestic and agricultural purposes.

The area does not fall within a groundwater control area; however groundwater remains the property of the government of Namibia. This means that government controls the exploration and usage of it. See Figure 6 for the hydrogeological map.

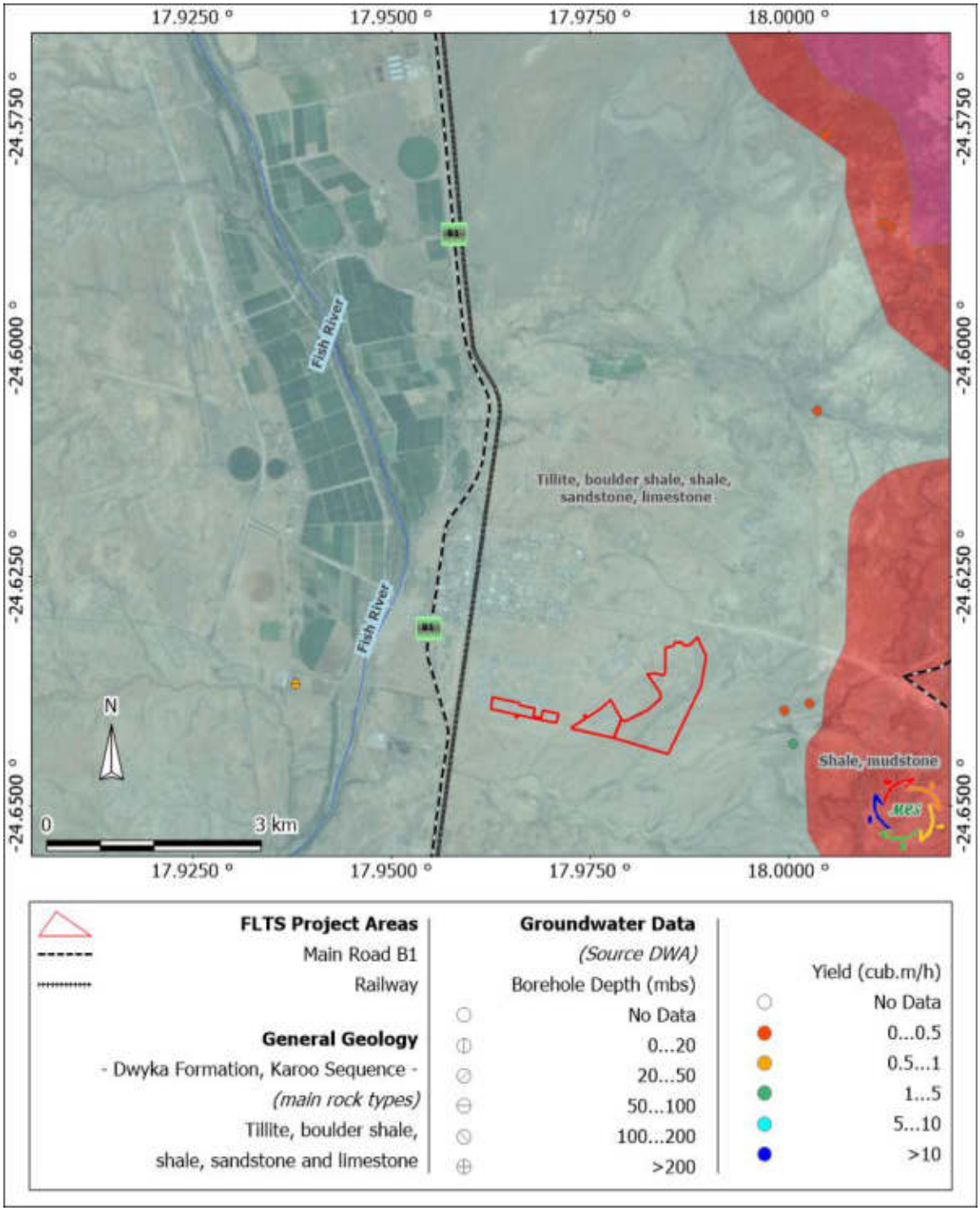


Figure 6. Hydrogeological map of study area

9.3.1 Groundwater Pollution Vulnerability

The geological framework that hosts the groundwater systems of the project area consists of intensely folded Namaqua Metamorphic Complex rocks. The numerous tectonic uplifts and erosion, graben lifts, thrusting and faulting episodes, of which the geology of the area was subjected to, resulted in geological structures and lineaments been created. Structures are not, however, easily visible on the surface because of cover of unconsolidated sands. Landsat

and aerial photographs are therefore of limited use, but aeromagnetic data combined with the satellite imagery has been used successfully in detecting fault-related lineaments in sand-covered areas (e.g. Zeil et al., 1991).

The presence of sensitive geological structures present in the area may form preferential pathways to the underlying aquifer. In order to protect these groundwater resources, pollution to these structures should be avoided at all cost.

9.4 General Ecology

The site falls within the Nama Karoo biome, which is characterised by Dwarf Shrub Savanna vegetation type. The dominant vegetation structure is low shrubs that usually grow on Eutric Leptosols soils present in this area. See Figure 6.

The Nama Karoo is known to support a varied assemblage of plant communities, ranging from deciduous shrub vegetation to perennial grasslands and succulent shrubs. The great wealth of plant species in the area is brought about by the geological substrates, soils and land forms. Seven vegetation types occur within the Nama Karoo biome of which most is arid.

The area has been previously disturbed with pedestrian movement (i.e. pedestrian walkways and tracks). Undisturbed vegetation is however also observed within the study area. The dominant vegetation on site consists mainly of medium height grass, scattered shrubs and weedy species and few scattered thorn bush and trees. No conservation worthy vegetation exists at the project location.

Deducing from the Atlas of Namibia, the proposed site is within the area that is known to have between 50 to 99 plant species (Mandelsohn et al, 2003). With regards to fauna, it is estimated that at least 51 to 60 reptiles, 61 to 75 mammal and 141 to 170 bird species (breeding residents) are known to or are expected to occur in the project area of which only a very few proportions are endemics.

Faunal species diversity is presented in the table below:

Table 2. General Fauna Diversity (Atlas of Namibia)

	Diversity	Endemism
Mammal	61 - 75 Species	5 - 6 Species
Scorpion	12 - 13 Species	0 Species
Bird	141-170 Species	0 Species
Reptile	51 - 60 Species	9 - 12 Species
Frog	8 - 11 Species	N/A
Lizards	28 - 31 Species	N/A
Termite	1 - 6 Genera	N/A

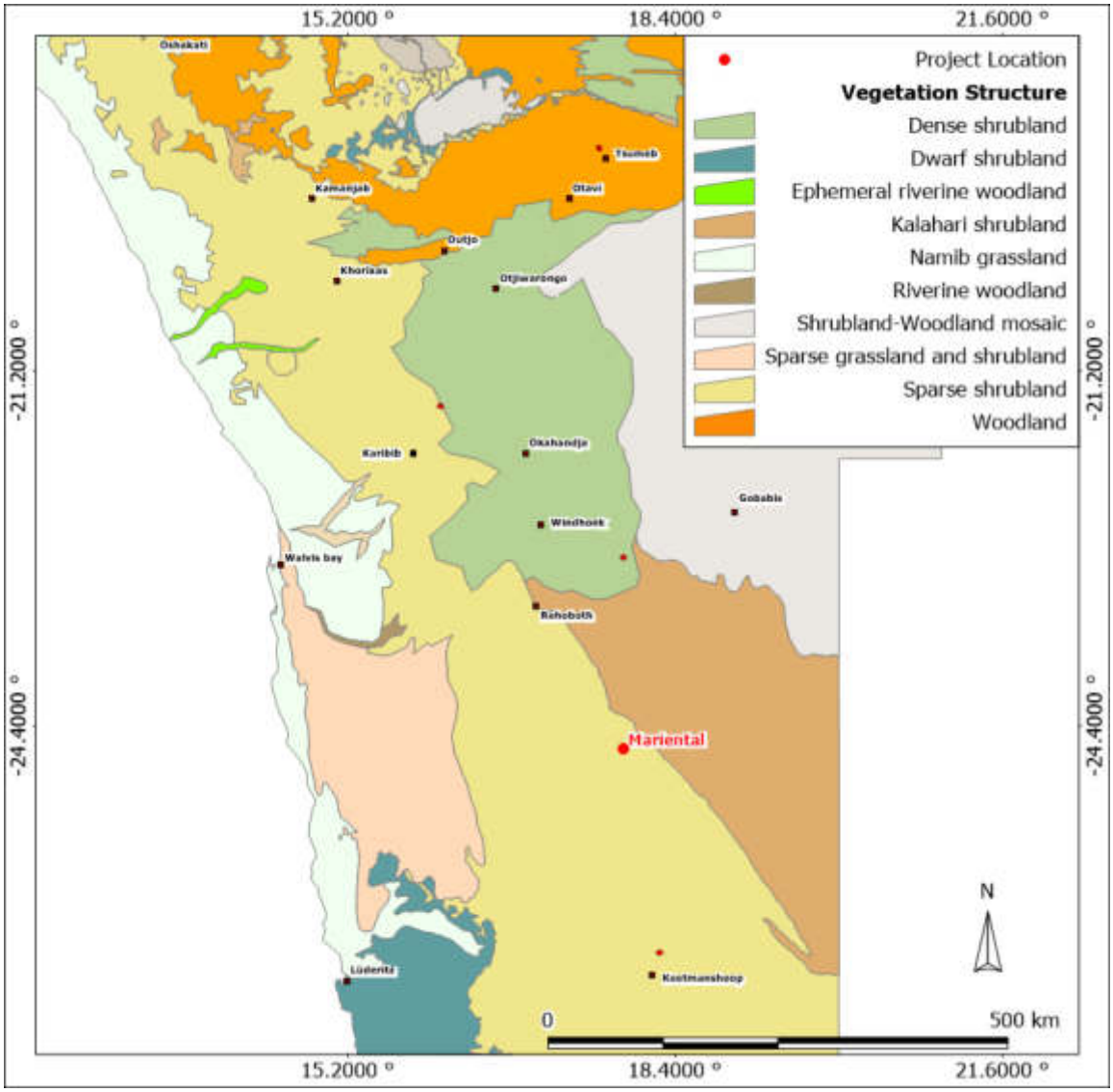


Figure 6. Vegetation structure map

9.5 Socio-Economic Aspects

This section provides an overview of socio-economic characteristics of the study area. It provides regional and local information on the, economic activities, population dynamics, vulnerability, and social services currently available in the area.

9.5.1 Regional information

The proposed development is situated in Mariental, in the Hardap Region of Namibia. The total current population is estimated to be 79,507 with 38,935 females and 40,572 males (NSA, 2011). Ninety-one percent of the population living in the Hardap Region over 15 years of age are literate (NPC, 2004). The estimated unemployment rate in Hardap region is 41.9% (NSA, NLFS 2018). The population density in the Hardap Region is 0.7 persons per km^2. The life expectancy in Hardap region is 53 years for females and 51 years in males (NPC, 2001). The Human poverty index (HPI) in Hardap Region is compared to 25.0 of the National HPI.

9.5.2 Mariental

Mariental is a town in south-central Namibia. It is located 221km north of Keetmanshoop and 261km southeast of Windhoek, along the main road B1.

9.5.2.1 Economic activities

Mariental is the administrative centre and capital town of the Hardap Region. The town forms part of the hub for all economic activities in the area and the region at large.

9.5.2.2 Employment (Job Opportunities)

Unemployment still hampers most of the developing world and Mariental is no exception. The proposed development is likely to increase the job opportunities at the settlement. The Construction phase of the project will provide job opportunities, of which 80% are expected to be unskilled and semi-skilled people and can be sourced from the unemployed labour force of Mariental and the surrounding areas.

The principle of maximising local employment creation can be applied by identifying suitable construction contractors in the region.

It is highly likely that suitable construction contractors would be identified in Mariental for the construction phase. The region is well-supplied with competent small and medium enterprise (SME) construction companies to conduct the proposed development. The project would also give rise to indirect economic benefits through the procurement of materials, goods and local services.

The local economy of the town is expected to benefit from the project. A percentage of moneys derived from salaries and wages earned by construction workers is likely to be spent at the coastal town. The moneys spent in communities around the project location would create substantial flows of revenue within these communities, thus acting as a catalyst for growth in the local economy.

In addition, procurement of construction materials, goods and services would have beneficial downstream economic impacts by stimulating demand up the supply chain. The more goods and services procured from local SMEs or enterprises at the town, the greater the project's contribution to the growth of the local economy.

It is therefore recommended that, where feasible, contractors employ local labour by recruiting from local communities and the region at large; that procurement of materials, goods and services from local suppliers be encouraged.

9.5.2.3 Livelihoods

Livestock farming and formal employment are the main livelihood activities in the Region. Game farming, hunting and ecotourism yield alternative income for some farmers. Nearly half of the population is employed in the private and public sectors. Therefore, making wages and salaries the main source of income for 64% of households in the Region. Pensions constitute the second main source of income for 13% of households, farming make up 7%, cash remittance 7% and non-farming business 4% of the population.

The livelihoods of the local community are likely to be positively impacted therefore predicted to be better than before the formal township establishments.

9.5.2.4 Tourism

Many tourists that visit the Mariental and the Hardap Region come to enjoy the safari and hunting experiences offered here in the south. In addition, private game farms and conservancies offer protection for wildlife, which then becomes an attraction to tourists and trophy hunters.

The area attracts a lot of tourists from all over the world. Excessive waste, dust, noise and vibrations can have negative impacts on the tourism industry in the area, as it can become a nuisance to tourists. Mitigation measures at the site must be put in place to reduce these impacts.

9.5.2.5 In - Migration

Due to enhanced employment opportunities that could be created by the envisaged project, some in-migration of job seekers to Mariental can be expected. Depending on the amount of in-migration, local areas may start experiencing overcrowdings, over use of infrastructure, local conflicts, increase of goods prices due to increased demand etc.

9.5.2.6 HIV & Prostitution

Namibia is one of the ten worst affected countries in terms of the HIV/AIDS epidemic. The HIV prevalence rate for the age group 15 to 49 is estimated at 16.9% for Namibia (UNDP, 2005). The HIV/AIDS prevalence rate in pregnant women aged 15 to 49 years in the Mariental District is 12% (Hardap Region is 8.8%).

The spending powers of locals working for envisaged township establishment projects are likely to increase, and this might be a perfect opportunity for sex workers to explore. Migrant labourers from other regions and expatriates are normally vulnerable and may use the services rendered by the sex workers.

Should the HIV prevalence increase, the following consequential issues could arise:

- ✓ Reduced workforce in the Hardap Region.
- ✓ Diversion of income expenditure to medical care.
- ✓ Increase in orphans and households headed by children.
- ✓ Increase in pregnancy related mortality.
- ✓ The current rate of 16,624 people per doctor could increase.

9.5.2.7 Infrastructure & Increased Traffic

The Hardap Region currently has a well developed infrastructure. Even though Mariental still has gravel roads that need upgrading. The main trunk road which provides a direct link from Windhoek to South Africa passes through Mariental. Plus the town has an all-weather landing strip for small to medium sized planes.

92% of households have access to safe water. Over 22% have no access to toilet facilities. Less than a half of all households have access to wood or charcoal for cooking, and nearly 85% of all households have access to electricity.

The Khoicas Road is the main access road to the proposed township development. This road should be carefully monitored for ease of traffic flow during all phases of the development. The number of traffic in the area is also expected to increase slightly and it might contribute to heavy traffic during peak hours and a higher number of car accidents.

9.5.2.8 Poverty Status

According to a survey in 2005, Hardap Region's Human Poverty Index of 25.0 percent is higher than the national average of 24.7 percent. In general with reference to all indicators (e.g. unemployment, life expectancy rates, access to land, access to safe water and toilet facilities, poverty etc) the Hardap Region has much room for improvement in comparison with the rest of the country.

In the Hardap, having insufficient land to farm on, being unemployed, and relying solely on a fixed monthly wages for those employed are regarded as the root causes of poverty in the region.

10. STAKEHOLDER PARTICIPATION

The principles of EMA govern many aspects of EIA's, including consultation with interested and affected parties (I&APs). Consultation with the public forms an integral component of an EIA investigation and enables I&APs e.g. neighbouring landowners, local authorities, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with the proposed development and to identify additional issues which they feel should be addressed in the EIA.

The primary aims of public participation were:

- ❖ To initiate participation of Interested and affected parties (I&APs).
- ❖ To inform I&APs and key stakeholders about the proposed development
- ❖ To identify issues and concerns of key stakeholders and I&Aps with regards to the proposed development.
- ❖ To provide information to enable informed decision making
- ❖ To develop a communication structure with stakeholder and I&APs
- ❖ To promote transparency of the project
- ❖ To ensure the public and stakeholders comments are considered for the development.
- ❖ To provide answers to I&APs queries
- ❖ To encourage shared responsibility and sense of ownership.

Decision-making authorities were consulted throughout from the outset of the study, and have been engaged throughout the project process. Public participation notices were advertised in two local newspapers on two different occasions, namely; (See Appendix C).

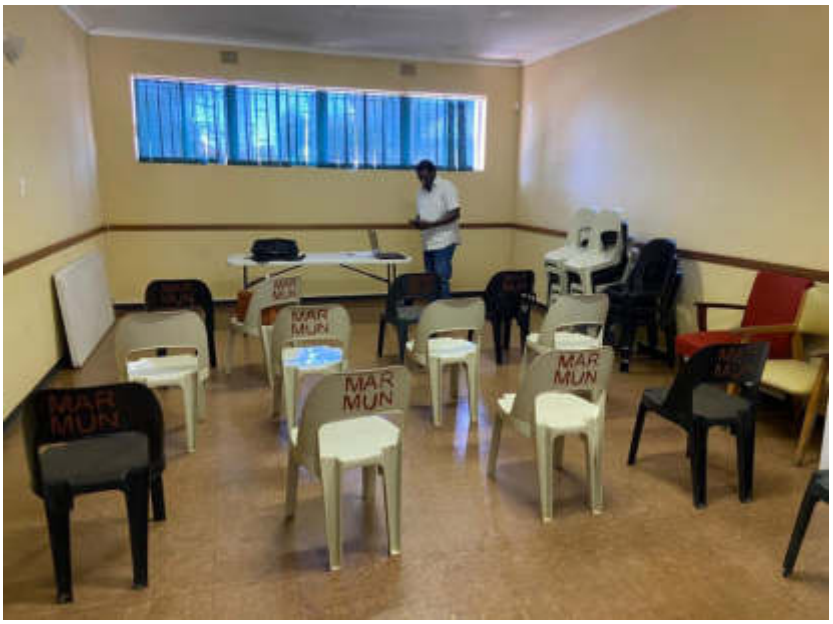
- ✓ The Namibian Newspaper, 03 and 10 March 2022
- ✓ New Era Newspaper, 04 and 11 March 2022

In the adverts an e-mail address, phone number and fax number was provided to the general public to register as interested and affected parties; and to request a background information document for the project. Posters (A3 size) were placed at strategic locations to invite interested and affected parties to the meeting, e.g. at the Municipal offices, Nampost, SPAR Supermarket and Police Station.

Some background information posters placed

A public meeting was held at the Aimablaagte Municipal Offices, in Mariental, at 10H00, on 17 March 2022.

An environmental assessment and process presentation was presented at the public participation meeting. Invited stakeholders did not make it to the meeting in spite receiving invitations and mass media advertising. The public participation meeting did not attract people, besides the client and consultant. The meeting went ahead, and no objections to project were recorded.



Public consultation meeting

Ms Basson (SPC) requested via e-mail to be registered as an I&AP, however no environmental concerns were raised with regards to the project. A background information document was available to all interested and affected before and after the meeting.

The Mariental Municipality (custodians of the project) indicated no obvious environmental concerns regarding the development, but advised that the EIA process be conducted as per environmental Management Act no 7 of 2007 and it's Guidelines of 2012. At the time of report writing, no further environmental or social concerns regarding the proposed township developments were received by the consultant from the general public.

Table 3. Interviewed Stakeholders/I&APS

NAME	ORGANISATION/ERF	INPUT
Ms. Saima Angula	Ministry of Environment and Tourism, Directorate of Environmental Affairs.	EA procedure
Mr. Paul Nghiwilepo	Mariental Municipality / Chief Executive Officer (CEO)	Proponent / Local Authority
Ms. Ilanza Awasman	Mariental Municipality / Town Planning Technician	Proponent / Local Authority
Ms. Semitha Kuria	Ministry of Agriculture, Water and Land Reform (MAWLR)	Proponent / Line Ministry
Mr. Kauuavali Neshila	KAMAU Town Planning & Development Specialist / Project Manager	Project Information
Ms. Fenni Nghiitwikwa	KAMAU Town Planning & Development Specialist / Urban Analyst	Project Information
REGISTERED I&AP		
0Ms. Bronwynn Basson	Stubenrauch Planning (SPC)	Interested/ Affected Parties

Consultation with the department of Environmental Affairs (MET) included the environmental assessment procedure and application procedure.

11. ENVIRONMENTAL IMPACT EVALUATION

The Environmental Impact Assessment sets out potential positive and negative environmental impacts associated with the proposed township development. The following assessment methodology will be used to examine each impact identified, see Table 4:

Table 4. Impact Evaluation Criterion *(DEAT 2006)*

Criteria	Rating (Severity)	
Impact Type	**+VE**	Positive
	0	No Impact
	-VE	Negative
Significance of impact being either	**L**	Low (Little or no impact)
	M	Medium (Manageable impacts).
	H	High (Adverse impact).

Probability:	Duration:
5 - Definite/don't know	5 - Permanent
4 - Highly probable	4 - Long-term (impact ceases
3 - Medium probability	3 - Medium-term (5-15 years)
2 - Low probability	2 - Short-term (0-5 years)
1 – Improbable	1 - Immediate
0 – None	
Scale:	**Magnitude:**
5 – International	10 - Very high/don't know
4 – National	8 - High
3 – Regional	6 - Moderate
2 – Local	4 - Low
1 - Site only	2 - Minor
	0 - None

11.1 Construction Phase of the Township Development

11.1.1 Erosion and Sedimentation

The project area is within the disturbed urban setting of Mariental; with little vegetation present. Clearing of the vegetation during earthworks is expected to take place and can make the project site susceptible to soil erosion especially during rainy seasons. The constant movement of heavy construction vehicles during construction also tend to compact the soil surface, which can reduce infiltration capability, and increase surface water runoff.

Proposed Mitigation Measures

- Avoid unnecessary removal of topsoil cover during construction.
- Ensure stockpiles are located within the boundary of the project sites; and are protected from erosion.
- Stabilise cleared areas as soon as possible to prevent and control surface erosion.
- Limit clearing of vegetation to those areas within the footprint of project sites.
- Minimise open areas and reduce the frequency of disturbance.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Erosion and Sedimentation	-VE	1	1	4	2	M	L

11.1.2 Dust Pollution and Air Quality

Wind direction in Mariental is predominantly northerly; whilst southerly winds also do occur mainly from October to January. Dust will be generated during the construction and installation of bulk services, and problems thereof are expected to be site specific. Dust is expected to be worse during the winter months when strong winds occur. Dust is regarded as a nuisance as it reduces visibility, affects the human health and retards plant growth.

Release of various particulates and exhaust fumes from construction vehicles and machinery during construction of bulk services is also expected to take place.

Proposed Mitigation Measures

- Ensure measures are in place to minimise dust generated during the construction phase.
- Use appropriate dust suppression measures when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather.
- Ensure excavations, handling and transport of materials which may generate dust under high wind conditions are short lived and well contained.
- Locate stockpiles of construction materials in sheltered areas where they are not exposed to erosive effects of the wind.
- Ensure all vehicle, plant and equipment are in good condition.
- Encourage reduction of engine idling.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Dust / Air Quality	-VE	1	2	6	3	L	L

11.1.3 Noise Impact

An increase of ambient noise levels at the construction sites is expected due to construction activities. Noise pollution due to construction vehicles, heavy-duty equipment and machinery will be generated. It is not expected that the noise generated during construction will impact any nearby land or properties.

Proposed Mitigation Measures

- Ensure the use of construction vehicles and equipment that emit reduced noise levels. Where necessary, use mufflers on vehicles.
- Ensure proper maintenance is conducted on vehicles to ensure the reduction of noise emission.
- The construction staff should be equipped with ear protection equipment.
- Audio equipment (if any) should not be played at levels considered intrusive by others.
- Construction activities will be limited to a period between 07h00 and 19h00.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Noise	-VE	1	2	4	3	L	L

11.1.4 Safety & Security

Safety issues could arise from construction vehicles, earthmoving equipment and tools that will be used during the construction phase. This increases the possibility of injuries and the contractor must ensure that all staff members are made aware of

the potential risks of injuries on site. Construction sites usually house construction building material and equipment on site which may attract criminal activities.

Proposed Mitigation Measures

- Display telephone numbers of emergency services at the project site.
- Provide suitable emergency and safety signage on site (manufactured of durable, weatherproof material). The signage signs should be placed at strategic locations to ensure awareness.
- Demarcate and barricade any areas which may pose a safety risk (including hazardous substances, deep excavations etc). These notices must be worded in English language.
- Enforce the use of appropriate Personal Protective Equipment (PPE) for the right task or duties at all times.
- Should a construction camp be necessary, it should be located in such a way that it does not pose a risk to the public.
- Equipment housed on site must be placed in a way that does not encourage criminal activities.
- For safety and security reasons it is recommended that the entire site (construction site and camp) be barricaded or fenced-off; and security personnel be employed to safeguard the project site and to avert criminal activates.
- Sensitize operators of earthmoving equipment and tools to switch off engines of vehicles, equipment and/or machinery not being used.
- The contractor is advised to ensure that the team is equipped with first aid kits and that they are available on site, at all times.
- Proper barricading and/or fencing around the work sites should be erected to avoid entrance of animals and/or unauthorized persons.
- Adequate lighting within and around the construction sites should be erected, when visibility becomes an issue.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Safety & Security	-VE	1	2	4	2	M	L

11.1.5 Traffic

Construction related activities are expected to have a minimal impact on the movement of traffic along the roads/streets in the area, as construction vehicles will frequent the project sites periodically.

A slight nuisance might be experienced by motorists in the area. This will most likely be caused by slow moving vehicles frequenting the construction sites.

Proposed Mitigation Measures

- Install and maintain official traffic signalling (where necessary) along the access roads / intersection in conjunction with local or national traffic regulations.
- Should diversion of traffic or closure of any road be necessary, the Mariental Municipality and Traffic Department should be consulted in this regard.
- Speed limit warning signs must be erected to minimise accidents.
- Construction vehicles and machinery must be tagged with reflective signs or tapes to maximise visibility and avoid accidents.
- Where feasible, Construction vehicles should not travel to and from the site during peak times (07h00 to 09h00 and 16h00 to 18h00), to minimise impacts on traffic.
- Construction vehicles should not be allowed to obstruct the road, hence no stopping in the road, wholly or partially, but rather pull off the road or park on the roadside.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Traffic	-VE	1	2	2	2	L	L

11.1.6 Groundwater

Groundwater quality could be impacted through leachate of petroleum, chemical, harmful and hazardous substances. In particular, oil leakages, diesel, lubricants and grease from construction vehicles, equipment and machinery utilised during the bulk servicing of the townships may occur. Care must be taken to avoid contamination of soil and groundwater.

Any overflow of the temporary sewage systems available, may transport the effluent through drainage lines in the area to the Fish River. Groundwater at the town is an important source of portable water for both domestic and agricultural purposes. The presence of geological structures (lineaments) in the area may act as preferential pathways for contaminants to groundwater.

Proposed Mitigation Measures

- Prevent spillages of any chemicals and petroleum products (i.e. oils, lubricants, petrol and diesel). Use drip trays and linings when evidence of leaks are observed on vehicles or equipment.
- No major servicing and maintenance of vehicles and/or equipment should be conducted at the project sites.
- All fuelling, storage and chemical handling should be conducted on surfaces provided for this purpose. Drip trays, linings or concrete floors must be used when removing oil from machinery.
- Spillage control procedures must be in place according to relevant SANS standards or better. Waste water collection systems should be connected to these systems.

- Should portable toilet facilities be necessary, adequate containment systems should be erected at the project site for use during the construction phase.
- Waste should be contained properly to avoid any leakages and/or spillages; and should be regularly disposed off at a suitable sewage disposal site. Avoid run-off from these toilets due to overflows at all cost.
- Proper environmental awareness and remedial response training of operators must be conducted on a regular basis.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Groundwater	-VE	1	3	4	2	L	L

11.1.7 Surface Water

Local drainage is well developed and runoff takes place through drainage lines in the area, towards the Fish River. Contamination of surface water bodies may occur through petroleum, chemical and hazardous substances. Contaminants in the form of oil leakages, diesel, lubricants and grease from the construction equipment and machinery may occur during the construction phase. Oil spills may form a film on water surfaces in the nearby streams causing physical damage to water-borne organisms.

Proposed Mitigation Measures

- Use drip trays and linings when evidence of leaks are observed on construction vehicles or equipment.
- Remove leaking vehicles from project location immediately.
- No servicing and maintenance of vehicles and/or equipment should be conducted at the project site.
- Any spillage of hazardous substances including fuel, oil, paint or cleaning solvent must be cleaned up immediately and disposed off at a designated disposal facility.
- Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and hydrocarbons into waterways or any surface water bodies.
- Prevent illegal washing out of containers in nearby waterways or any surface water bodies.
- Properly secure all portable toilets (if any) to the ground to prevent them toppling due to wind or any other cause.
- Maintain toilets in a hygienic state and remove waste to a licensed disposal facility.
- Ensure that no spillages occur when the toilets are cleaned or emptied. Prohibit urination on site, other than at designated facilities.
- Contain contaminated water from batching operations and allow sediments to settle before being disposed of as waste water.

- Stabilise cleared areas as soon as possible to prevent and control surface erosion.
- Proper environmental awareness and remedial response training of operators must be conducted on a regular basis.
- An emergency plan should be in place on how to deal with spillages and leakages during this phase.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Surface water	-VE	2	3	6	2	M	L

11.1.8 Generation of Waste

Waste material will be generated during the construction activities of the township developments. Waste in the form of rock cuttings, building rubble, pipe cuttings, oil spills or leakages of petroleum products may occur during the construction phase.

Proposed Mitigation Measures

- Ensure that sufficient weather- and vermin- proof bins / containers are present on site for the disposal of solid waste. Waste and litter generated during this phase must be placed in these disposal bins.
- Empty bins regularly as required.
- Contractor shall institute a waste control and removal system for the site.
- All waste shall be disposed off site at an approved landfill site.
- No disposal of /or burying of waste on site should be conducted.
- No waste should be burned on site.
- All hazardous waste storage are to be clearly marked to indicate the presence of hazardous substances, and the protocols associated with handling of such hazardous wastes shall be known by all relevant staff members.
- Solid and liquid hazardous waste shall be stored in separate containers. The waste should be disposed of at an approved hazardous waste disposal site.
- Regular inspection and housekeeping procedures should be maintained at all times.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Waste Generation	-VE	1	3	6	4	M	L

11.1.9 Heritage Impacts

There are no known heritage areas envisaged to be impacted by the new development; however the contractor may come across archaeological features or objects that possess cultural values during construction activities.

Proposed Mitigation Measures

- If such remains or objects with cultural values (e.g. bones, weapons, ancient cutlery, graves etc) are uncovered at the project location or surrounding, it should be barricaded off, and
- The relevant authorities (i.e. the local police and National Heritage Council of Namibia) should be contacted immediately.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Heritage	-VE	1	2	2	2	L	L

11.1.10 Ecological Impacts

The site is previously disturbed with little fauna and flora observed. No conservation worthy vegetation is present at the site.

Proposed Mitigation Measures

- Limit clearing of vegetation to those areas within the footprint of construction sites.
- Disturbance of areas outside the designated working zone is not allowed.
- No vegetation should be removed outside the designated project area.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Ecology	-VE	1	2	2	2	L	L

11.1.11 Socio-Economic Aspects

Temporary employment opportunities are anticipated to be created during construction, both directly through construction workers and indirectly through suppliers, service providers, and informal traders attracted to the project site.

Proposed Mitigation Measures

- Construction contractor(s) should be sourced from Mariental, and surrounding areas.
- Construction workers should be sourced from Mariental, and surrounding areas.
- Suppliers of construction materials should be sourced from Mariental, and surrounding areas.
- Locally source services required during the construction process, such as securities, rental of portable toilets, plant hire, etc.
- Designate an area outside the construction sites for informal traders (if any), to allow them to trade.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Socio-economic	-VE	1	1	8	2	L	L

Summary of all potential impacts during the construction phase:

In general, impacts are expected to be low to medium, mostly short lived and site specific. Mitigation options recommended in the Environmental Management Plan (EMP) will guide and ensure that the impacts of the construction work are minimised. Proper storm water management plans must be in place to minimise the risk of flooding and pollution, and must form part of the engineering designs.

The appointed contractor should be made aware of the content and environmental requirements of this report through proper induction training.

11.2 Operational Phase of the Township Development

11.2.1 Air Quality

Vehicles that will be accessing the township developments will contribute to the release of hydrocarbon vapours, carbon monoxide and sulphur oxides into the air. Possible release of sewer odour, due to sewer system failure or maintenance might also occur.

Proposed Mitigation Measures

- All maintenance of bulk services of the township have to be designed to enable environmental protection.
- Regular air quality monitoring should be conducted at the project site.
- Keep a complaints register regarding bad odour / smells at the project sites; and act on it if becomes a regular complaint.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Air Quality	-VE	1	4	4	2	L	L

11.2.2 Generation of Waste

Waste in the form of solid waste from households, businesses and institutions will be generated. Waste will be removed and disposed off at a suitable waste disposal site by the Mariental Municipality and its waste removal contractors (e.g. Rent-a-Drum, Kleen Tek etc).

The municipality will provide waste skips around the township developments like the rest of the suburbs in Mariental.

Proposed Mitigation Measures

- Waste bins / containers must be readily available at the township development at all times. Ensure that the waste bins / containers are weather- and vermin- proof.
- Any waste generated must be contained and disposed off accordingly.

- No burning or burying of waste on site should be conducted.
- Empty bins regularly as required.
- All waste shall be disposed off site at an approved landfill site.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Waste Generation	-VE	1	2	5	2	L	L

11.2.3 Surface and groundwater

Spillages might also occur during maintenance of the sewer system. This could have impacts on groundwater especially in cases of large sewer spills.

Groundwater users exist in the Mariental area; and potential impact on the natural environment from possible polluted groundwater exits. The area is subjected to geological structures which may act as preferential pathways for any contaminants entering the saturated zone.

Proposed Mitigation Measures

- Proper design of bulk installations and containment mechanisms installed should be able to contain any leakages that might occur during the operation and maintanance of the township developments.
- Maintaining the installation in good operating order is of paramount importance in preventing failure of bulk services.
- Proper containment response and readiness should be available during operations and maintenance.
- During maintanance operations, remove leaking vehicles and/or equipment from project location immediately.
- The presence of an emergency response plan and suitable equipment is advised, so as to react to any spillage or leakages properly and efficiently.
- Ensure all stormwater drains or channels are clear of litter or obstructing material.
- Remove all excess sedimentation, rubble and any other waste material present in waterways and dispose of in a suitable manner to ensure proper drainage runoff.
- Ensure that stormwater management systems are regularly maintained and tested, and are in good working order.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Surface and groundwater	-VE	2	2	6	3	M	L

11.2.4 Health and Safety

A number of health and safety threats exist during operational activities of township developments. Waste water from leaking pipes (if unattended) can lead to waterborne diseases such as cholera, dysentery, typhoid and diarrhea, which is a health risk to local communities. Severe noise pollution can also become a nuisance, which can result in dangerous confrontations and/or violence, depression, headaches etc. Accidents on roads could increase as a result of increased traffic; and deteriorated roads in and around the township developments.

Safety issues could also arise from the vehicles, equipment and tools that will be used on during maintenance activities.

Proposed Mitigation Measures

- Residence / contractors must be made aware of safety and hazardous nature of powerline and electrical utilities, wastewater etc.
- Fire fighting equipment and first aid kits should be readily available and serviced regularly at the township developments.
- Keep lawn clippings and other flammable items in safe places.
- Avoid uncontrolled and unauthorised open fires at the township development.
- Display contact details of emergency services, informative and warning signage at relavent locations of the development.
- Demarcate and place signage on any areas which may pose a safety risk (including trenches, excavations etc).
- Maintanance personnel / contractors are advised to ensure that proper personal protective gear and first aid kits are available, at all times. Staff should be properly trained in first aid and safety awareness.
- Ensure that installations of bulk services at the township developments are installed and approved by relavent qualified personnel who will issue Certificates of Compliance.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Health & Safety	-VE	1	3	6	3	M	L

11.2.5 Ecological Impacts

The operations of the development will have minimal impacts on fauna and flora; however vegetation control in and around the townships must be maintained.

Proposed Mitigation Measures

- Vegetation in open spaces should not be disturbed or removed during the operational phase.

- Minimise the area of disturbance by restricting movement to the designated working areas during Maintenance.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Ecology	-VE	1	2	2	2	L	L

11.2.6 Socio-Economic Aspects

The creation of new employment opportunities is eminent for maintanance activities; and is considered to be a positive impact. At this stage, it is unclear how many temporary and permanent employment positions will be created but jobs will be created.

Proposed Mitigation Measures

- Employment creation should be targeted at the immediate communities of Mariental.
- Maintanance contractors should be sourced from Mariental, or the region at large.
- Locally source services required during the operational process, such as securities, plant hire, etc.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Socio-economic	-VE	1	1	8	2	L	L

11.3 Decommissioning Phase

The impacts associated with this phase will be similar to that of the construction phase. The Environmental Management Plan for this phase will have to be reviewed at the time of decommissioning to cater for changes made to the development.

12. CUMMULATIVE IMPACTS

These are impacts on the environment, which results from the incremental impacts of the township establishment projects when added to other past, present, and reasonably foreseeable future actions regardless of what person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In relation to an activity, it means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or undertakings in the area.

Possible cumulative impacts associated with the development of township includes groundwater contamination, noise emissions, land disturbance, traffic and possible accidents involving vehicles frequenting the area. These impacts could become

significant and this could collectively impact on the environmental conditions in the area. Cumulative impacts could occur in both the operational and the construction phase.

Impact Evaluation:

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Cummulative impacts	-VE	1	3	4	3	L	L

13. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan **(EMP)** provides management options to ensure impacts of the proposed development are minimised. An EMP is an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented, and the positive benefits of the projects are enhanced.

The objectives of the EMP are:

- ✓ to include all components of the development;
- ✓ to prescribe the best practicable control methods to lessen the environmental impacts associated with the construction of the development;
- ✓ to monitor and audit the performance of construction personnel in applying such controls; and
- ✓ to ensure that appropriate environmental training is provided to responsible construction personnel.

The EMP acts as a stand-alone document, which can be used during the various phases of the proposed development. All contractors taking part in the construction of the facility should be made aware of the contents of the EMP. An EMP for the construction, operational and decommissioning phases of the proposed development has been developed and is attached as Appendix A.

14. CONCLUSIONS

In general, the proposed development would pose limited environmental and social risks.

All environmental risks can be minimised and managed through implementing preventative measures and sound management systems. It is recommended that this information be made available to the community on a regular basis.

The Environmental Management Plan should be used as an on-site tool during all phases of the township development.

Future environmental audits should be carried out to ensure compliance of the EMP and environmental regulations of Namibia. Parties responsible for non-

conformances of the EMP will be held responsible for any rehabilitation that may need to be undertaken.

Should the township development be modified and/or extended to a different area, it is recommended that a different EIA be done for the probable new location.

15. REFERENCES

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