

ENVIRONMENTAL IMPACT ASSESSMENT

**FOR SERVICE PROVISION AND TOWNSHIP ESTABLISHMENT FOR NORTHERN
INFORMAL SETTLEMENTS**

OF

**OMUTHIYA AND ONGHUWO YE PONGO, ONE NATION 1, ONYIKA, GREENWELL
MATANGO D, OKAHANDJA PARK D AND FREEDOM LAND A & B.**

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CITY OF WINDHOEK

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LIST OF ABBREVIATIONS

CoW	City of Windhoek
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
I&APs	Interested and Affected Parties
MET: DEA	Ministry of Environment and Tourism: Directorate of Environmental Affairs
ToR	Terms of Reference

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1 INTRODUCTION

The City of Windhoek (**CoW**) intends to apply to NAMPAB and Township Board to upgrade, formalise and proclaim the informal settlements of Omuthiya and Onghuwo ye Pongo, One Nation 1, Onyika, Greenwell Matongo D, Okahandja Park and Freedom Land A & B. These informal settlements are situated at the outskirts in the Northern Periphery of Windhoek.

This will be done according to the “Development and Upgrading Strategy”, which focus on in-situ upgrading. This means providing services where informal houses are located, and formalising of houses later by owners.

Informal Settlements of Greenwell Matango D, Onyika and Freedom Land A & B has already been upgraded while Omuthiya and Onghuwo Ye Pongo, One Nation 1 and Okahandja Park D still needs to be upgraded. Some of this informal settlements in the Northern Periphery of Windhoek is currently zoned “*Undetermined*”, while others are situated on erven zoned residential, business and public open spaces and was not originally intended for residential development, but it has been inhabited or are existing informal settlements. In order to rezone the proposed areas to “general residential, institutional, business and public open space” for township proclamation, the CoW is required to undertake an Environmental Impact Assessment (**EIA**).

In terms of Section 27 of the Environmental Management Act, 2007 (Act No. 7 of 2007), the formalisation of a new township development or extensions falls under the list of activities that may not be undertaken without environmental clearance certificate. Thus, the proposed areas require an environmental clearance certificate in order finalise the formalisation process.

The initial scoping and Environmental Management Plan (**EMP**) was done by NAMENV Consultants in 2010. At that time an urgent EMP was needed to guide the construction services and the report was produced, however application of Environment Clearance Certificate was not done. Upgrading of the scoping

report and EMP is done internally by the Environment Management Division within the CoW.

1.1 Terms of Reference 1

In July 2010 after the visit by the Head of State, President Hifikepunye Pohamba, followed by the City's Strategic Planning Workshop, the CoW in consultation with the Central Government identified areas for urgent government interventions project. Government provided aid for the provision of basic services in the areas of Omuthiya, Onghuwo Ye Pongo, Okahandja Park D and One Nation 1. The basic services included water reticulation lines, sewer lines, stand pipes and toilets. NAMENR Consultants were appointed to conduct an EIA for the implementation of this project to avoid adverse environmental impacts, to inform infrastructure sitting/layouts decisions and maintain community support.

Due to the urgency of the project, that EIA ran concurrently with the implementation of the project which took less than three months (last months in 2010) in the already occupied unproclaimed informal settlement. Design layouts for the proposed areas at that time were not completed and the EIA was used to guide implementation of infrastructure.

The objectives of the EIA included:

- **Compilation of baseline information.** That the EIA process should generate baseline data, describing the fauna and flora, geo-hydrology, demographic parameters of the residents, economic activities of the residents, existing land uses, existing and planned infrastructures amongst others.
- **Effective public participation** will be critical component of this EIA given the huge number of residents in the informal settlements. The EIA process will engage the stakeholders (interested and affected parties) to gauge their concerns and opportunities in informal settlements; and their concerns as related to services such as the provision of water, sanitation, electricity and roads.

- **Impact identification and assessment.** Infrastructural development is expected to have both positive and negative impacts on the surrounding environment and people during the construction and implementation phases. These envisaged impacts will be captured during the actual biophysical assessment and public consultation process.
- **Impacts classification and mitigation measures.** The nature, magnitude, duration, extent, the likelihood of occurring and significance of impacts will be assessed and described. Mitigation measures will be suggested to avoid and or minimise any envisaged impacts on the receiving environment and people. Also, mitigation measures will seek to enhance positive impacts of planned developments.
- **Environmental Management Plan.** The EMP will focus on lessons learned and recommendations for best practices for community development and future provision of municipal services in informal settlements.

However, this excluded the service provisions of electricity, stormwater and roads. The informal settlement areas for Onyika, Greenwell Matongo D, Okahandja Park D and Freedom Land A & B were excluded.

1.2 Terms of Reference 2

Since the City wants to formalise these informal settlements to proclaimed townships, the purpose of this assessment is to review and update the EIA done in 2010. This revision is done internally by the Environment Management Officials within the CoW.

The objective is to compile the EMP for additional services of roads, electricity and stormwater to be provided at Omuthiya and Onghuwo Ye Pongo and One Nation 1 informal settlements. In addition four, informal settlements has been added which will get the services of water reticulation, sewerage system, roads, electricity and stormwater. They are Onyika, Okahandja Park D, Greenwell

Matango D and Freedom Land A & B. The layout plans for all these settlements are complete.

The objectives of this study are to upgrade the EIA and EMP for the Informal Settlements done in 2010 for the application of the Environment Clearance Certificate from the Ministry of Environment and Tourism.

1.3 Limitations

The proposed sites are already occupied and most of the biodiversity is disturbed.

1.4 Purpose of EIA

The EIA study serves to determine, analyse and present the environmental impacts (positive and negative) of a proposed development project and associated infrastructure, formulate remedial measures to mitigate the negative impacts and plan in such a way that enables a rational decision to be made regarding the implementation and management of the proposed project. The EIA further contributes to the reduction or mitigation of adverse impacts by generating a number of project alternatives for the proposed developments. In general, the purpose of the EIA is to anticipate and prevent, minimise and/or manage, potential significant negative impacts on development that may:

- Cost too much money to rectify in future,
- Pose risk to lives, livelihood or health of current and future generations,
- Help to seek opportunities to optimise potential benefits of development.

The CoW, as a local authority is committed to enhance positive biophysical and social environmental impacts of the project while mitigating negative impacts of the project.

Therefore, this EIA Report has been prepared with a view to comply with Namibia's Environmental Assessment Policy of 1995, the Environmental Management Act No 7 of 2007 (Section 27(2)(a), Government Notice No 29 OF 2012 (Listed Activities, No 11.2) and Government Notice No 40 of 2012 (EIA Regulations).

2 APPROACH TO STUDY

2.1 Approach of EIA

The EIA process will comply with Environmental Management Act 7 of 2007. Diagram 1 below sets out the impact assessment process that will be followed. Included is a public participation process which provides opportunities for stakeholders and the public at large to engage in the process and to make comment or express their concerns regarding the proposed project. This public participation process component is fundamental to the impact assessment process and is an important informant to decision-making. Specialist studies of Biophysical Environment, groundwater studies and Socio Ecological forms part of this study. Environment impact assessment and an EMP, which will address environmental management statements for all the phases of the project, will form an integral part of the EIA Report.

2.2 Outline of the Environmental Impact Assessment Report

The Environmental Impact Assessment Report sections are structured as follows:

- Introduction
- Approach to study
- Legal framework
- Description of Project
- The Affected Environment
- Summary of Specialist Studies
- Public Participation
- Environmental Impacts and proposed Mitigation measures
- Conclusions
- References
- Annexures
 - o Specialist study Reports
 - o EMP

2.3 EIA Process followed

The EIA process will comply with the Environment Management Act 7 of 2007 and all its regulations. The diagram, Diagram 1, below sets out the impact assessment process that will be followed.

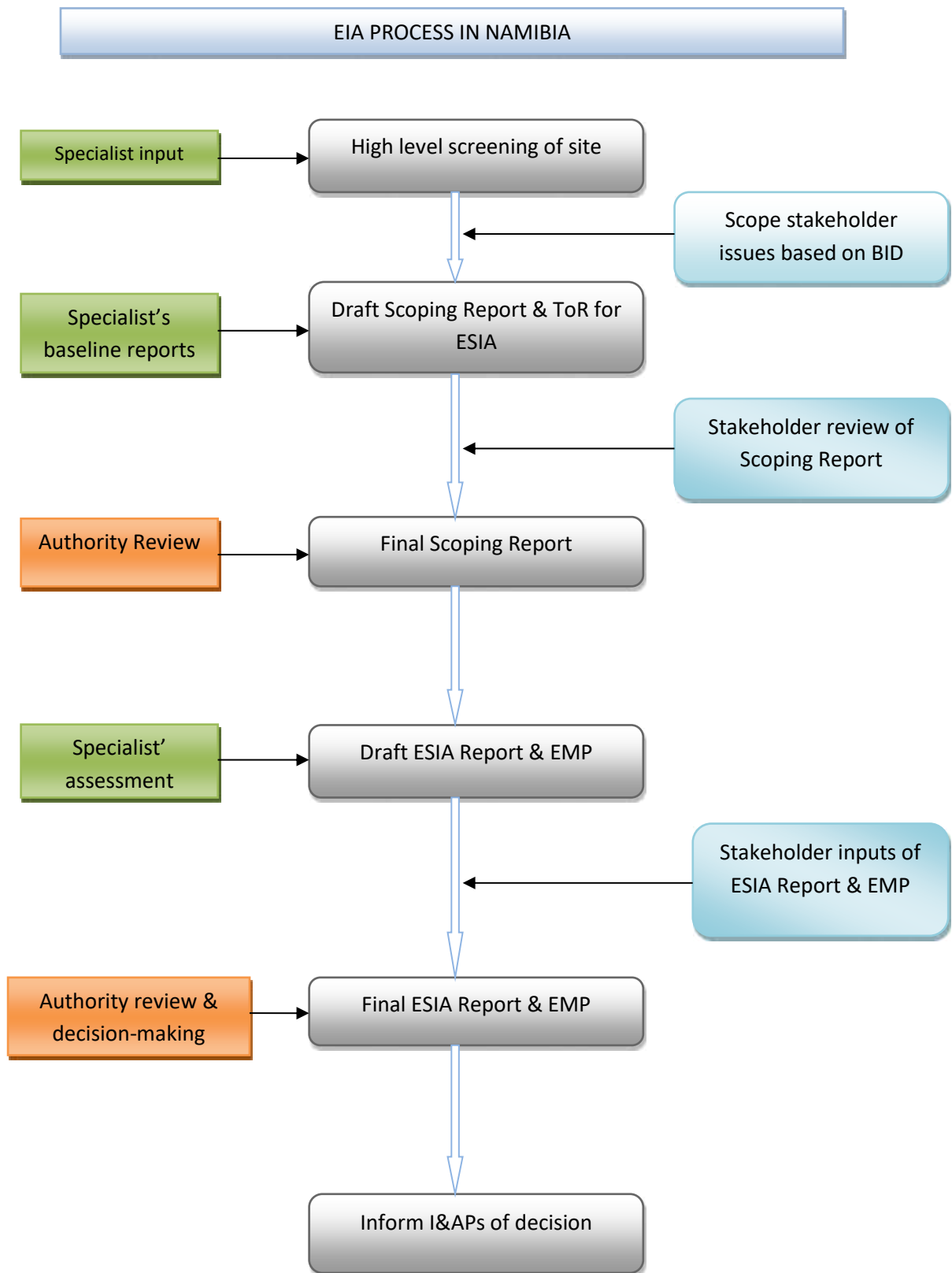


Diagram 2: EIA process

3 LEGAL FRAMEWORK

The implementation of projects requiring EIA, should proceed within the framework of Namibia’s policy and legal environment. The policies and legislations listed below relate to the protection of the biophysical environment and have relevance to the type of project activities planned. The legal environmental framework of the project is tabulated below.

Table1. Legal Environmental Framework of the Project.

LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Environmental Management Act (No 7 of 2007) and Namibia’s Environmental Assessment Policy (1995)	Schedule 1: Screening list of policies/ plans/programme/ project subject to full Environmental Assessment. “The rezoning of land from use for nature conservation or zoned open space to any other land use”. (Ministry of Environment and Tourism (MET), Directorate of Environmental)	An Environmental Impact Assessment is compulsory.
LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Windhoek Town Planning Scheme (2005)	Allowed activities under “Residential Building” and “Residential Unit”.	“Any person intending to erect a building in any use zone may be required by Council to furnish an environmental assessment report having regard to the promotion of health, safety, order, amenity, convenience and general welfare and the impact the new buildings and the operations are likely to have on the amenity of the locality”.

Windhoek Environmental Structure Plan (2004)	It indicates all sensitive and environmentally fragile zones that should be conserved and protected. These areas should be considered with great care and when planning for any development project. The document is mainly helping in applying sound environment planning and management (Section 3.3.1, page 60). (City of Windhoek)	Only strategic service developments should be allowed after environmental impact assessment.
Forest Act, 2001 (Act No. 12 of 2001)	Provision of the protection of various plant species (Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry).	A Harvesting Permit needs to be acquired from the Directorate of Forestry for the removal of indigenous certain tree species from the site
LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Townships and Division of Land Ordinance No 11 of 1963	“(I) 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 that township to include such area”. (Minister of Regional and Local Government).	A new township needs to be created for approval by the Namibian Planning Advisory Board and the Township Board.
Water Resources Management Act, 2004 (Act No. 24 of 2004)	Control of disposal of sewerage, the purification of effluent, the prevention of surface and groundwater pollution and the sustainable use of water	Developers need to develop a satisfactory plan for sewerage disposal.

	resources. (Department of Water Affairs).	
Sewerage and Drainage Regulations (amendments) Local authorities Act, section 23, 1992	Affords the prevention of pollution and environmental damage caused by the improper construction of sewerage and water pipelines in drainage lines. (City of Windhoek).	Provides guidelines for the proper construction of pipelines in drainage lines.
LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Soil Conservation Act 76 of 1969	Prevention and combating of soil erosion, conservation, improvement and manner of use of soil and vegetation, and protection of water sources. (Ministry of Environment and Tourism).	Removal of vegetation cover is to be avoided and minimized at all costs.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development. (National Heritage Council of Namibia).	Immediately inform the National Heritage Council of Namibia should any archaeological material e.g. graves be found during the construction phase. The site should be cleared for archaeological potential before construction may commence.
LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Labour Act (No 11 of 2007)	135 (f): “the steps to be taken by the owners of premises used or intended for use as factories or places where machinery is used, or by occupiers of such premises or by users of machinery in connection with the structure of	The Act specifies the measures to be taken to secure the safety and the preservation of the health and welfare of employees at work.

	such buildings of otherwise in order to prevent or extinguish fires, and to ensure the safety in the event of fire, of persons in such building”; (Ministry of Labour and Social Welfare).	
Convention on Biological Diversity (CBD)	Namibia is obliged under international law to conserve its biodiversity.	Projects should refrain from causing any damage to the country’s biodiversity.
Convention to combat Desertification	Namibia is bound to prevent excessive land degradation that may threaten livelihoods.	This is a general requirement to be considered in all projects.

4 DESCRIPTION OF PROJECT

4.1 Omuthiya and Onghuwo Ye Pongo

4.1.1 Description of the Proposed Activity

City of Windhoek intends to apply to the Namibia Planning and Advisory Board (NAMPAB) and the Township Board for the subdivisions, rezoning and consolidations of Erven 386, 527, 528 and 789, Okuryangava to create a total of 34 new 1 erven. The area is already inhabited by 517 households. This will be followed by a township establishment application on the newly created portions to both NAMPAB and the Townships Board.

4.1.2 Locality and surrounding Land Use

The Omuthiya and Onghuwo Ye Pongo informal settlements are located in Okuryangava Township, the low income area situated in the North Western parts of Windhoek. The living conditions of the residents of both areas are in dire need of improvement. In order to improve the living conditions, an upgrading of the area is necessary as it will also pave the way for the provision of basic essential services. The area was settled illegally by the inhabitants in a disorderly fashion. The surrounding land uses are predominantly residential in nature. Access to the four erven can be obtained from Ongava, Ombakata and Okahwe Streets.

The location is best appreciated in Figure 1 below

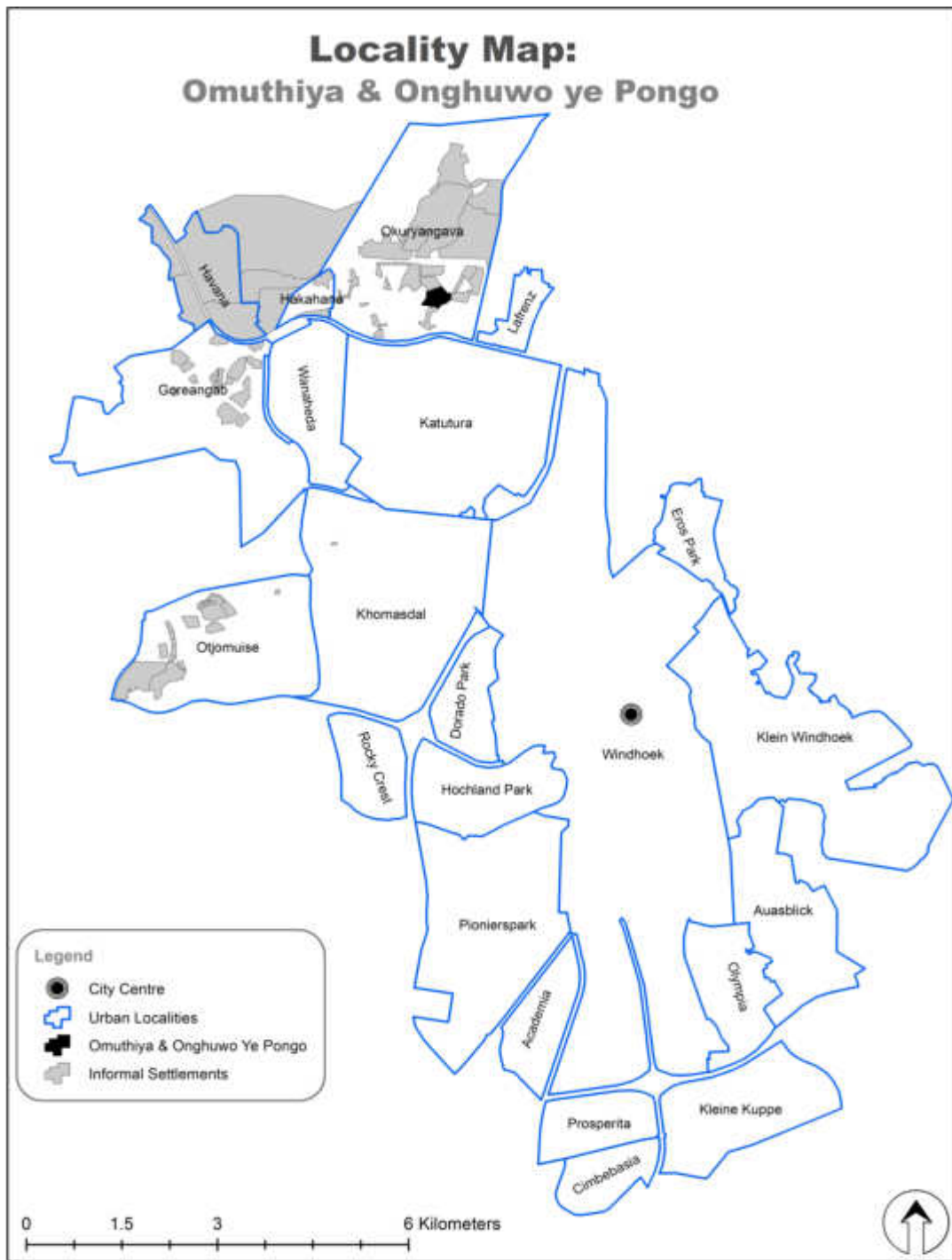


Figure 3. Locality Map for Omuthiya and Onghuwo Ye Pongo informal settlement

The three erven are located in an area characterized by a predominantly single “Residential” zoned erven. Other land use zoning such as “Public Open Space”, “Business”, “Institutional” and “Municipal” also exist.

4.1.3 Land Ownership

Erven 386, 527, 528 and 789, Okuryangava are owned by the CoW. These four erven are currently zoned ‘Institutional’ (Erven 386 and 789), ‘General Residential’ with a density of 1:100 (Erven 527 and 528), and ‘Public Open Space’ respectively (Erf 789).

4.1.4 Project Rationale

A socio-economic survey was conducted to determine the number of people residing in the area. According to the City’s records there are a total of 517 households. The population of the area totals 1041 people. Approximately 258 households need to be relocated to alternative sites in order to make room for the upgrading of the area. These households will be relocated to Otjomuise Extension 10 after the completion of the Servicing project. Services are being provided in Otjomuise Extension 10 under the Targeted Intervention for Employment creation and Economic Growth (TIPEEG) program.

Due to the rezoning and proposed township development that will result in the creation of 34 new erven, an EIA in accordance with the Environment Management Act 7 of 2007 is required.

Due to the low level of services, upgrading of the area was deemed necessary and desirable in order to improve the living conditions of the inhabitants. The City intends to upgrade this settlement once Otjomuise Ext 10 is completed.

4.1.5 Current Land uses

The land use before the upgrading program and after the upgrading program is described below.

4.1.5.1 Land use before Upgrading Project

The dominant land use in the area is residential with a number of home based businesses scattered in the area. According to the City's records there are a total of 517 households, which totals to a population of 1041 people. Approximately 258 households need to be relocated to alternative sites in order to make room for the upgrading of the area.

The area is currently served with communal facilities in the form of water and toilet facilities. The area is also not currently connected to the electrical network of the City and is characterized by a high level of illegal connection.

Refuse removal is provided through the use of black plastic and skip containers. The black plastic bags are collected weekly for disposal at Kupferberg landfill site.

4.1.5.2 Proposed Land use after Upgrading Program

The proposed subdivisions of Erven 386, 527, 528 and 789, Okuryangava; rezoning of various portions as well as subsequent consolidations as indicated on plan P/4112/A Sheet 2, attached hereto, depicts the proposed land uses.

The following new land uses will be provided in Omuthiya and Onghuwo Ye Pongo Informal Settlement during reorganization and overall upgrading process:

i) Erven

The following new land uses are proposed:

- Nineteen (19) Single Residential erven with a density of one dwelling per 300m². These will be sold to those within the areas that meet the City's allocation criteria.
- Ten (10) General Residential Block Erven with a density of one dwelling per 150m². These erven are earmarked to accommodate residents who cannot afford to purchase Single Residential erven.
- Two (2) Institutional zoned erven to accommodate two kindergartens already in existence in the area.
- Two (2) Public Open Space erven to accommodate storm water runoff and river courses.

- One (1) erf zoned Street, to facilitate ease of access to all newly created erven.
- The Remainder will be reserved for “*Street*”
- No “*Business*” zoned erf is provided in the area because businesses that caters for the needs of the local community is operating within the immediate surroundings. However, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant council policies.

A total of 34 erven of various sizes and zoning will be created from the intended subdivisions of the four erven in order to create a habitable living environment for the inhabitants of Omuthiya and Onghuwo Ye Pongo settlement.

The erf yield is indicated in the Table 2 below:

Table 2: Erf yield for Omuthiya and Onghuwo Ye Pongo Settlement

Erf yield
19 Single Residential erven at a density of 1:300
10 General Residential Block erven (with 232 sites) at a density of 1:150
2 Institutional erven
1 Public Open Space, and 1 Remainder Street
Total number of erven 34

4.1.6 Proposed and Existing Services

4.1.6.1 Water

The area is supplied with communal water points from which the residents collect water for their consumption and use. With the proposed development all erven will be provided with individual water connection points. These

communal water points will be removed once all the three households are connected to the Municipal water network.

4.1.6.2 Sewer

The area is underlain by a sewer line traversing some of the erven in an irregular fashion. In order to accommodate the proposed development, the sewer line will be realigned and the proposed Public Open Space erf will accommodate the line accordingly. Extensions of the sewer network to enable individual connections will also be made.

4.1.6.3 Streets

Ombakata Street on the north, Okahwe Street in the south and Ongava Street on the west provides access to the area with tarred road infrastructure. Local streets are informal and of gravel material. A proposed tarred main street will be provided while access to sites on General Residential blocks will be through gravel roads.

4.1.6.4 Electrical services

Electrical services to the residents of the area do not exist but future connections to all erven will be made with the upgrading of the area. Upgrading of electrical services to accommodate the proposed development has been done and households have access to individual connections.

4.1.7 The Layout

The proposed new layout plan for Omuthiya and Onghuwo Ye Pongo Informal Settlement is shown on the proposed layout plan for Omuthiya and Onghuwo Ye Pongo Informal Settlement P/4112/A/Sheet 3.



Figure 4. The proposed new layout plan for Omuthiya and Onghuwo Ye Pongo Informal Settlement

4.2 One Nation 1

4.2.1 Description of the Proposed Activity

The CoW intends to apply to NAMPAB and the Townships Board for the subdivision of Erf Re/3908, Okuryangava to create 273 new erven. This will be followed by a township establishment application to the Townships Board. The informal settlement located on the erf is commonly known as “One Nation No 1”.

4.2.2 Locality and surrounding Land Use

The One Nation No 1 informal settlement is located in the Okuryangava Extension 6 Township, in the north western parts of Windhoek. One Nation No1, borders Omuvapu Street to the west and is bound by Julius Nyerere in the North as well as Nampower power lines servitude in the South.

The living conditions of the residents of the area are in dire need of improvement. In order to improve the living conditions, an upgrading of the area is necessary as it will also pave the way for the provision of basic essential services. The area was settled illegally by the inhabitants in a disorderly fashion. The surrounding land uses are predominantly informal in nature. Access to the erf can be obtained from Omuvapu and Julius Nyerere Streets.

The location of this settlement is presented in Figure 5 below.

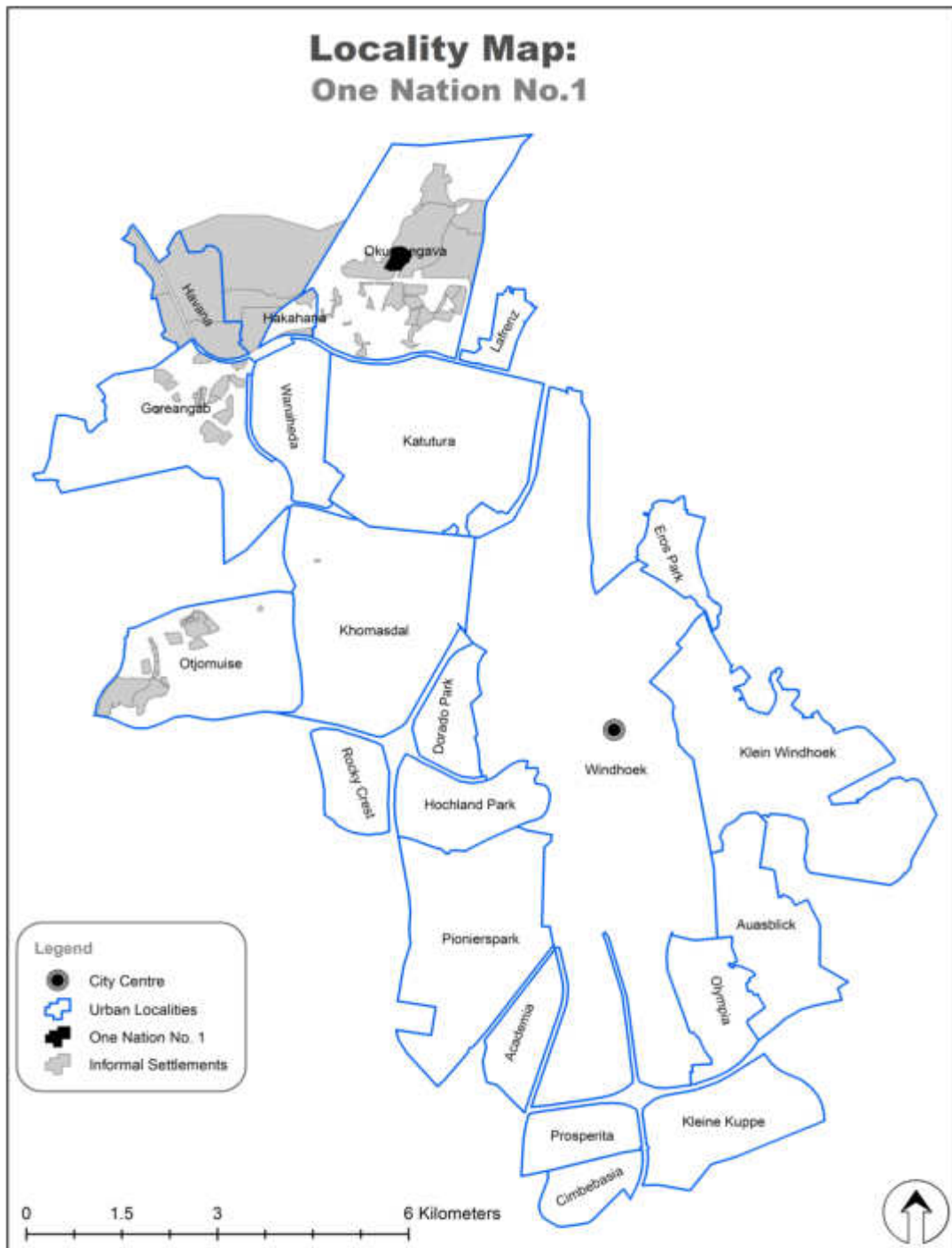


Figure 5. Locality map for One Nation 1 informal settlement

The erf is located in an area characterized by a predominantly informal “Residential” neighbourhood. The site measures approximately 176011m² and is ideally located for residential development.

4.2.3 Land Ownership

Erf RE/3908, Okuryangava is owned by the CoW.

4.2.4 Project Rationale

A socio-economic survey was conducted to determine the number of people residing in the area. According to the City’s records there are more than 517 households. The population of the area calculated at two people per household will number approximately 1034 people. A total of 200 of the households need to be relocated to alternative sites in order to make room for the upgrading of the area. These households can be relocated to Otjomuise Extension 10 after the completion of the Servicing project. Services are being provided in Otjomuise Extension 10 under the Targeted Intervention for Employment creation and Economic Growth (**TIPEEG**) program.

The area is currently served with communal facilities in the form of water and toilet facilities.

Due to the low level of services upgrading of the area was deemed necessary and desirable in order to improve the living conditions of the inhabitants.

4.2.5 Current and Proposed Land Uses

The land use before the upgrading program and after the upgrading program is described below.

4.2.5.1 Land use before Upgrading Program

The dominant land use in the area is Residential with a number of home based businesses scattered in the area. Residents of the area are served with two communal water points and the area is not connected to the electrical network of the City. A waterborne sewer system network exists in the area to which future waterborne toilets can be connected. Although sewer systems are

available in the area, there are no individual toilet facilities in the area, but community toilets are provided.

Refuse removal is provided through the use of black plastic and skip containers. The black plastic bags are collected weekly for disposal at Kupferberg landfill site.

There are electricity network connections in the surrounding area and only a few households have been connected.

4.2.5.2 Proposed Land use after Upgrading Program

The CoW is proposing new land uses which will be implemented during the reorganization of the households and will form part of the overall upgrading process as indicated on layout plan *Plan P/1930/S Sheet 1*, attached hereto.

The following new land uses will be provided in One Nation No 1 Informal Settlement:

i) Erven

- Two hundred and fifty two (252) Single Residential erven with a density of one dwelling per 300m². These will be sold to those within the areas that meet the City's allocation criteria.
- Two (2) General Residential Block Erven with a density of one dwelling per 150m². These erven are earmarked to accommodate residents who cannot afford to purchase Single Residential erven. These individuals can join a savings group and purchase the land as a block. The City will create an informal subdivision into sites that can be allocated to the group members.
- Four (4) Institutional zoned erven to accommodate kindergartens and churches already in existence in the area.
- Three (3) Public Open Space erven to accommodate storm water runoff and river courses.
- Four (4) erven zoned Remainder Street
- One (1) Remainder (zoned municipal) to facilitate ease of access to all newly created erven.

- One (1) erf (zoned undetermined erven for future development by the City.
- Six (6) Business zoned erven to cater for the needs of the residents in the area.
- In addition, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant council policies.

The erf yield is indicated in the Table 3 below:

Table 3: Erf yield for One Nation 1

ERF YIELD	Erf No
Single Residential erven at a density of 1:300	252
General Residential Blocks	2
Institutional erven	4
Business zoned erven	6
Undetermined erven	1
Public Open Space, Street Portion and Municipal erven	3
	4
	1
TOTAL NUMBER OF ERVEN	273

4.2.6 Proposed and Existing Services

4.2.6.1 Water

The area is supplied with communal water points from which the residents collect water for their consumption and use. With the proposed development all erven will be provided with individual water connection points. These communal water points will be removed once all the three households are connected to the Municipal water

network.

4.2.6.2 Sewer

The area has a sewer line traversing some of the erven in an irregular fashion. In order to accommodate the proposed development, the existing sewer line will be realigned and accommodated on Public Open Space zoned erven accordingly. Extensions of the sewer network to enable individual connections will also be made.

4.2.6.3 Streets

Omuvalu Street on the west, Julius Nyerere in the North and Ongava Street in the south will provide access to the area with tarred road infrastructure. Local streets are informal and of gravel material. A proposed tarred main street will be provided while access to sites on General Residential blocks will be through gravel roads.

4.2.6.4 Electrical services

Upgrading of electrical services to accommodate the proposed development will be done and households will have access to individual connections.

4.2.7 The Layout

The revised new layout plan to be used for the upgrade of One Nation No 1 Informal Settlement is shown in figure 4.

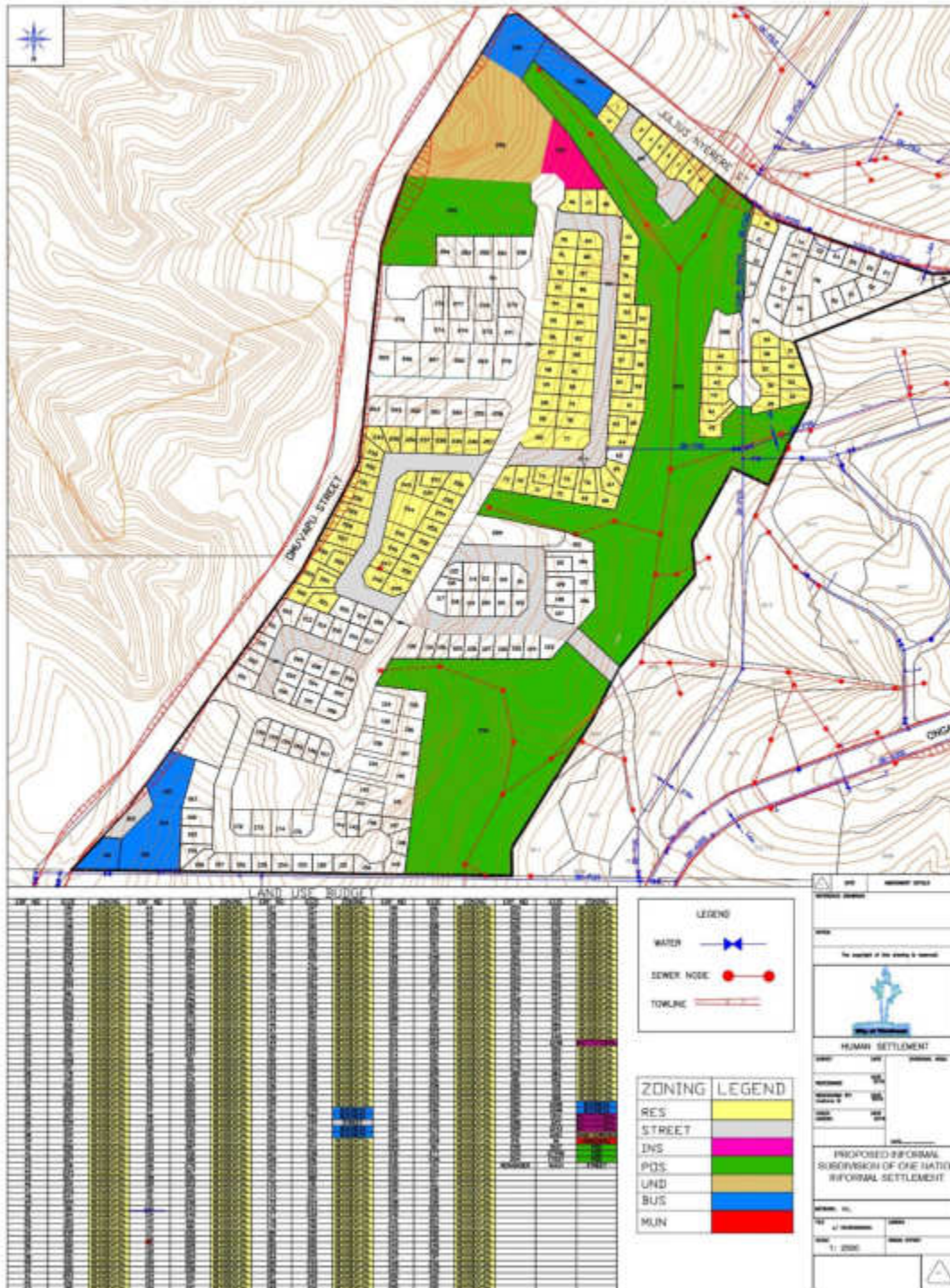


Figure 6. the revised layout of One Nation No.1

4.3 Onyika

4.3.1 Description of the Proposed Activity

Onyika Informal Settlement consist of Erf 2330 Okuryangava Extension 5 and Erf 19, Okuryangava Township, which was initially settled illegally by inhabitants in a disorderly manner. This area was upgraded in 2011 in—accordance to Development and Upgrading Strategy which provided 22 Single Residential erven, 5 General Residential erven that has informally been subdivided into 140 sites, one Institutional erf, 1 Municipal erf, 1 Remainder – the Street and 1 Public Open Space.

The parent erven will be rezoned and consolidated to form a single consolidated Erf that will then be subdivided into 22 Single Residential erven, 5 General Residential erven with 140 sites, one Institutional Erf, 1 Municipal Erf, one remainder –the Street and one Public Open Space. This will be followed by a township establishment application to NAMPAB.

Although these erven are situated within a formally planned township of Okuryangava, the typical proposed development was not included in the previous township establishment application and approval.

4.3.2 Locality and surrounding Land Use

Onyika Informal Settlement is located in the northern informal settlements of Windhoek. It is situated on Erf 19 and Erf 2330 in Okuryangava Extension 5, some 7 kilometres to the north of the City Centre. The site is bordered by Ongava Street to the east and is situated in the middle of a formally planned township (Okuryangava Township). The location is best appreciated in figure 3 and 4 below.

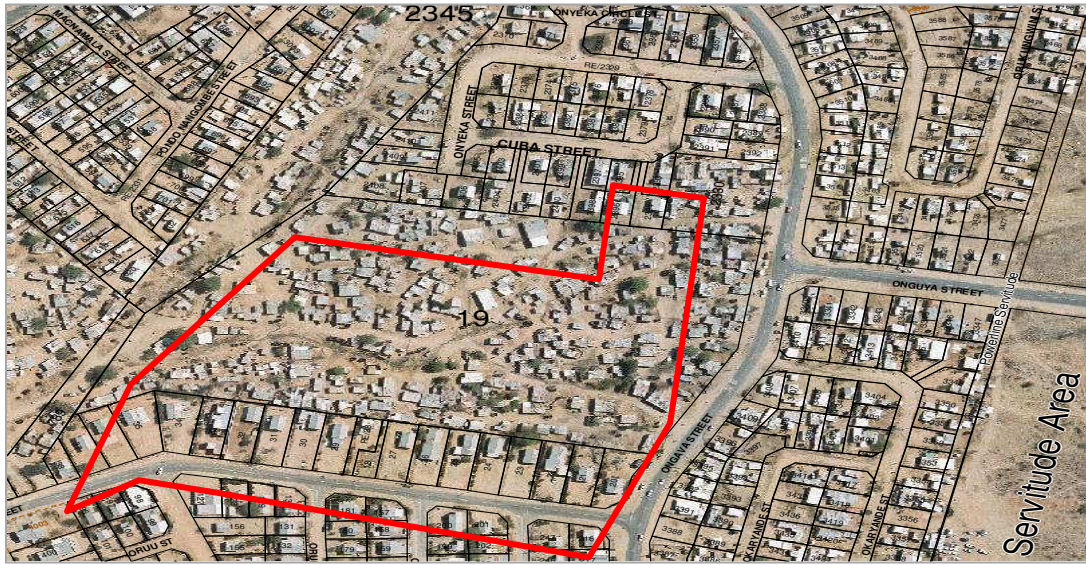


Figure 7. Site map of the Onyika Informal Settlement

The area surrounding Erven 19 and 2330 Okuryangava is predominantly Single Residential zoned erven. Other land use zoning such as “Public Open Space”, Business”, “Institutional” and Municipal” also exist.

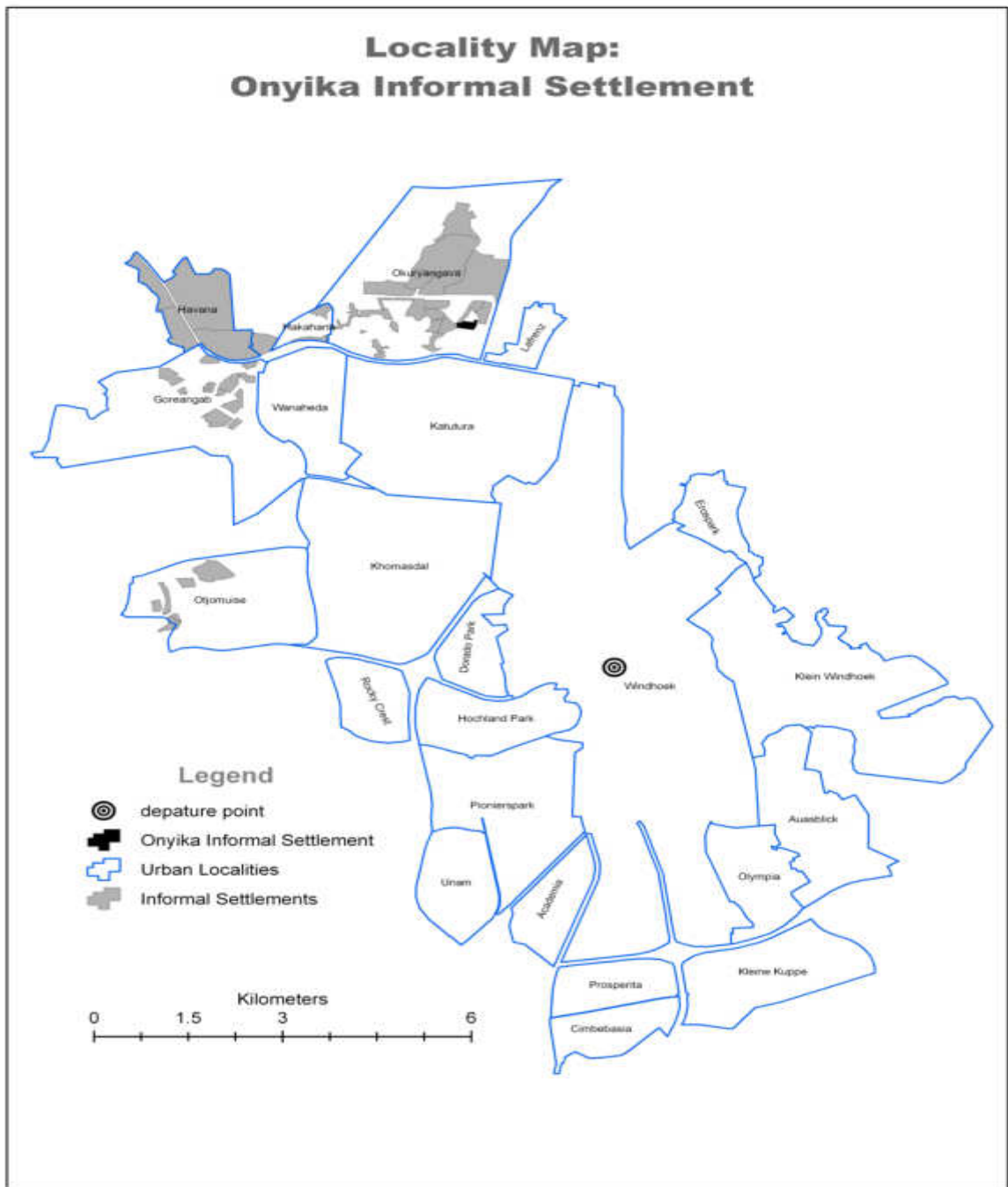


Figure 8. Locality Map of the Onyika Informal Settlement

4.3.3 Land Ownership

The CoW owns Erf 19 and Erf 2330 that constitute Onyiika Informal Settlement. As mentioned before, Erf 19 is zoned as “Residential” while Erf 2330 is rezoned as ‘General Residential’.

4.3.4 Project Rationale

Erf 19 is subdivided into more than 10 portions and Erf 2330 is rezoned from Institutional to General Residential, and as such an EIA with accordance to the Environment Management Act 7 of 2007 is required.

The continuous inflow of people to the informal settlements has resulted in an increased proportion of the urban poor who lacks basic services at acceptable convenience levels and land tenure security.

The Socio-economic Survey Report done by the CoW in 2007, indicates that Onyika informal settlement required upgrading in order to improve the living conditions of the local inhabitants. Like many other un-planned settlements, the general living condition of people residing in Onyika was below acceptable level and as such immediate intervention of the CoW through informal settlement upgrading programme was called for.

The pressing situation which the people of Onyika informal settlement found themselves in (paired with - local, regional, national and international goals on improved living conditions) justified the need and desirability for the upgrading of the said informal settlement. This upgrading was done in 2010.

4.3.5 Current and Proposed Land uses

The land use before the upgrading programme and after the upgrading programme is described below.

4.3.5.1 Land use before Upgrading Programme

At the start of the Onyika settlement upgrading project in 2007, there were 308 households and 2 kindergartens, however the general level of services was very poor. There were only two communal water points and two communal toilets

serving a population of about 1,131 people. The area was not connected to electricity. Refuse removal was provided through the use of black plastic and skip containers. The black plastic bags were collected weekly for disposal at Kupferberg landfill site.

In light with the above, and as part of the upgrading drive, deliberate effort was made by the City of Windhoek to improve the level of services and proposed new land uses.

4.3.5.2 Land use after Upgrading Programme

The CoW proposed the new land uses which was implemented during the upgrading process, in 2010.

The following new land uses, infrastructure and services were implemented for Onyika:

i) Erven

- Twelve single “*Residential*” zoned erven with a density of 1 dwelling unit per 300m².
- Six “*General Residential*” zoned erven with a density of 1 dwelling unit per 150m² were provided for groups to lease or buy Block Erven. These erven would consequently be subdivided informally into sites of approximately 150m² - 180m², by the group members.
- One “*Institutional*” zoned erf is provided to accommodate an existing kindergarten.
- One “*Municipal*” zoned erf is provided to accommodate an electrical miniature substation.
- One “*Public Open Space*” zoned erf is provided to accommodate storm water. During the dry seasons the erf can be used as an informal playground.
- The Remainder of Erf 19, is reserved for “*Street*”
- No “*Business*” zoned erf is provided in the area because businesses that caters for the needs of the local community is operating within the immediate surroundings. However, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant

council policies.

The erf sizes and yield are indicated in the table below.

Table 4. Erf sizes and yield for Onyika Informal Settlement

Erf no	Size (m²)	Erf yield
Erf 19,		12 Residential erven at a density 1:300 5 General Residential erven (140 sites) at a density of 1:150 1 Institutional erf 1 Municipal erf 1 Remainder Street, and 1 Public Open Space
Erf 2330,	2,598 m ²	1 General Residential erf (10 sites) at a density of 1:150
Total		22 erven

ii) Water

Water reticulation system is available for individual connections. The two water stand pipes were demolished.

iii) Sewerage and wastewater disposal

Sewerage system was installed which drains to the Gammams Wastewater Treatment Plant. The two communal toilets were demolished.

iv) Roads and access

The main street is 10 m wide, graded and bladed in accordance with Development Level 2 stands as stipulated in the Development and Upgrading strategy. Access ways within the Ongava Street abuts both Erf 19 and Erf 2330 providing the area with a good road access.

v) Electrical services

Bulk services available, individual connections possible.

vi) Solid waste collection and disposal

Refuse removal is provided through the use of black plastic and skip containers and were collected weekly for disposal at Kupferberg landfill site.

4.3.6 The Layout

The layout plan which shows the current services as January 2011 for Onyika Informal Settlement is shown in the attached layout plans. The attached layout plan, *Plan P/4084/A Sheet 1* shows the level of services in 2007 and *Plan P/4084/A Sheet 1* shows the level of services in 2011.

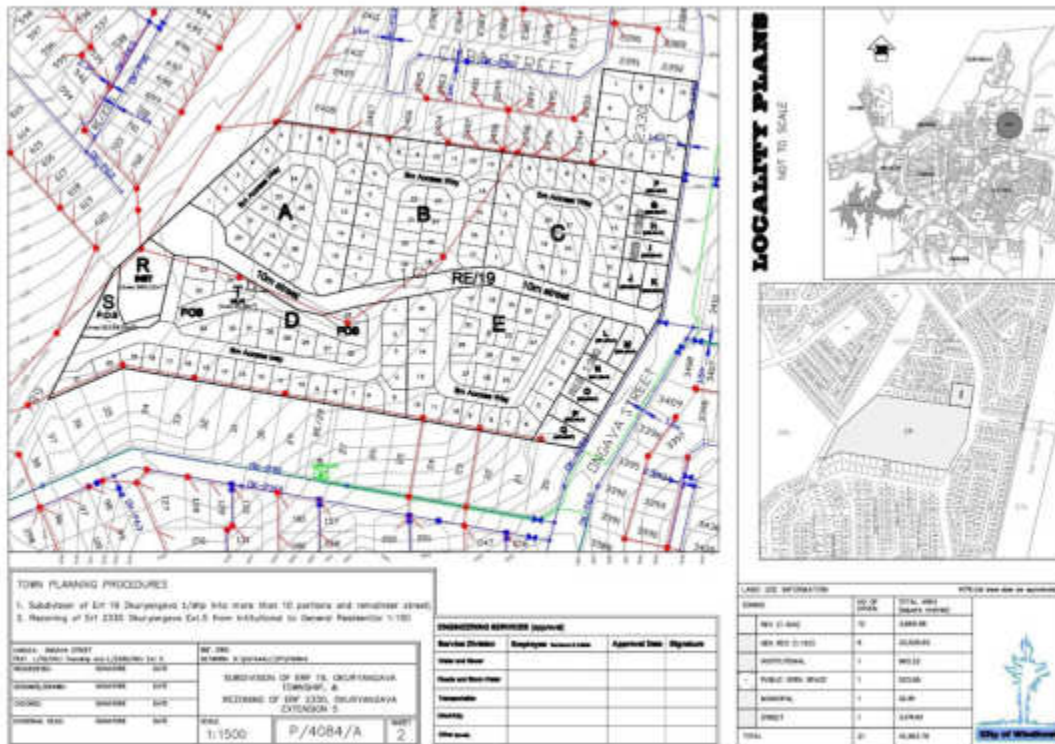


Figure 9. The layout plan for Onyika Informal Settlement, since January 2011.

4.4 Greenwell Matongo D

4.4.1 Description of the Proposed Activity

The Greenwell Matongo D Informal Settlement consists of Erf 253, Erf 281 and Erf 283, Goreangab which was initially settled illegally by inhabitants in a disorderly manner. This resulted in about 380 households with approximately 800 to 900 people, with a poor level of services. This area was then upgraded in 2011 in accordance to Development and Upgrading Strategy to 14 Single Residential erven, 15 General Residential erven, 3 Public Open Space erven and one Street, the remainder.

However, all three erven will be rezoned and consolidated to form a single consolidated erf with a subsequent subdivision into 14 Single Residential erven, 15 General Residential erven, 3 Public Open Space erven and One Street, the Remainder. This will be followed by a township establishment application to NAMPAB. Gravel roads will be constructed along the proposed streets. The basic services of water reticulation, sewerage system and electricity network have been provided and such was guided by the spatial pattern depicted on the layout.

4.4.2 Locality and surrounding Land Use

Greenwell Matango D is located in Extension 1, of Goreangab in the north-western informal settlements of Windhoek. The informal settlement is located on erven 253, 281 and 282 Goreangab Extension 1. The surrounding Land uses are predominantly residential in nature. Eileen and Tolla streets provide access in the west and east respectively.

The locations will best be appreciated on figure 10 below.

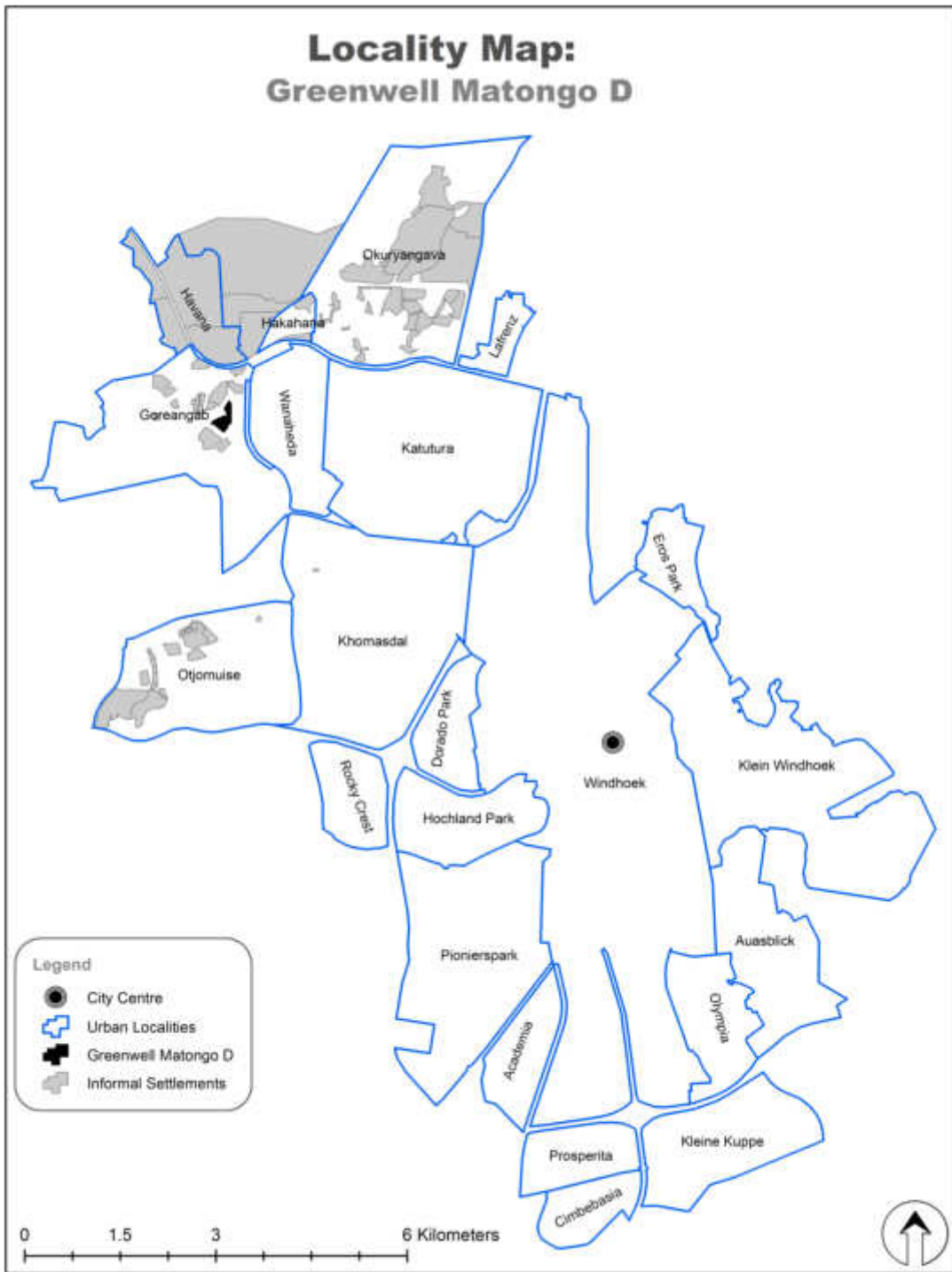


Figure 10. . Locality map of Greenwell Matongo D.

4.4.3 Land Ownership

Erf 253, 281 and Erf 283, Goreangab makes up the Greenwell Matongo D Informal Settlement and are owned by the CoW. Currently Erf 253 is zoned Residential with a density of 1:300 while Erf 281 is zoned Undetermined and Erf 283 is zoned Institutional.

4.4.4 Project Rationale

All three erven will be rezoned and consolidated to form a single Consolidated erf that will be subdivided into 14 Single Residential erven, 15 General Residential erven, 3 Public open Space erven and one Street, the remainder. This Consolidated erf will be rezoned followed by a township establishment. As a result an EIA in accordance with the Environment Management Act 7 of 2007 is required.

At the commencement of the Greenwell Matongo D settlement upgrading project, there were 380 households. This represents approximately 800-900 people living in the area. However, the level of services in the area was very poor.

These services include communal facilities in the form of water and toilet structures. Electrical network of the City was also not included.

Due to the low level of services upgrading of the area was deemed necessary and desirable in order to improve the living conditions of the inhabitants. This upgrading was done in 2011.

4.4.5 Current Land uses

The land use before the upgrading programme and after the upgrading programme is described below.

4.4.5.1 Land use before Upgrading Programme

The dominant land use was residential with a number of home based businesses scattered in the area. At the start of the Greenwell Matongo D settlement upgrading project, there were 380 households. However, the level of services in the area was very poor. The area was supplied with two communal water points.

The area was served with communal water points and communal toilets and was not connected to the electrical network of the City.

Refuse removal was provided through the use of black plastic and skip containers. The black plastic bags were collected weekly for disposal at Kupferberg landfill site.

4.4.5.2 Proposed Land use after Upgrading Programme

The CoW proposed the new land uses which were implemented during the reorganization of the households and upgrading process.

The following new land uses were provided in Greenwell Matongo D Informal Settlement:

i) Erven

- Fourteen single “*Residential*” zoned erven with a density of 1 dwelling unit per 300m².
- Fifteen “*General Residential*” zoned erven with a density of 1 dwelling unit per 150m² will be provided for groups to lease or buy as Block Erven. These erven would consequently be subdivided informally into sites of approximately 150m² - 180m², by the group members.
- Three “*Public Open Space*” zoned erf is provided to accommodate storm water. During the dry seasons the erf can be used as an informal play grounds.
- The Remainder of the Consolidated Erf X, is reserved for “*Street*”
- No “*Business*” zoned erf is provided in the area because businesses that caters for the needs of the local community is operating within the immediate surroundings. However, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant council policies.

A total of 33 erven of various sizes and zoning were created from the subdivision of Consolidated Erf X, Goreangab Extension 1. See table on the following page for details:

The erf yield is indicated in the table below:

Table 5. Erf yield for Greenwell Matongo D

Erf no	Size (m²)	Erf yield
Consolidated Erf X,	66482,258 m ²	<ul style="list-style-type: none"> - 14 Single Residential erven at a density of 1:300 - 15 General Residential erven (with 232 sites) at a density of 1:150 - 1 Remainder Street, and - 3 Public Open Space
Total		33 Erven

ii) Water

Bulk water supply infrastructure to which individual connections were made has been provided. About 99% of the residents thus far have individual water connections in the area. Three households utilising communal water points accounts for a total of 1%. This communal water point will be removed once all the three households are connected to the existing water network.

iii) Sewer

The area was underlain by a sewer line traversing all three erven in an irregular fashion. In order to accommodate the proposed development, the sewer line was realigned accordingly. Extensions of the sewer network to enable individual connections were also made.

iv) Streets

Access is obtained from Tolla and Eileen Streets. Tolla Street abuts all three erven i.e. Erven 253, 281 and 282, while Eileen Street also borders Erf 282 on the north western corner providing the area with a good road access.

v) Electrical services

Electrical services to Erven 253, 281 and 282 is provided. Upgrading of electrical services to accommodate the proposed development has been done and households have access to individual connections.

4.4.6 The Layout

The proposed new layout plan for Greenwell Matongo D Informal Settlement is shown on the attached layout plan, *Plan P/4140/A Sheet 2*.

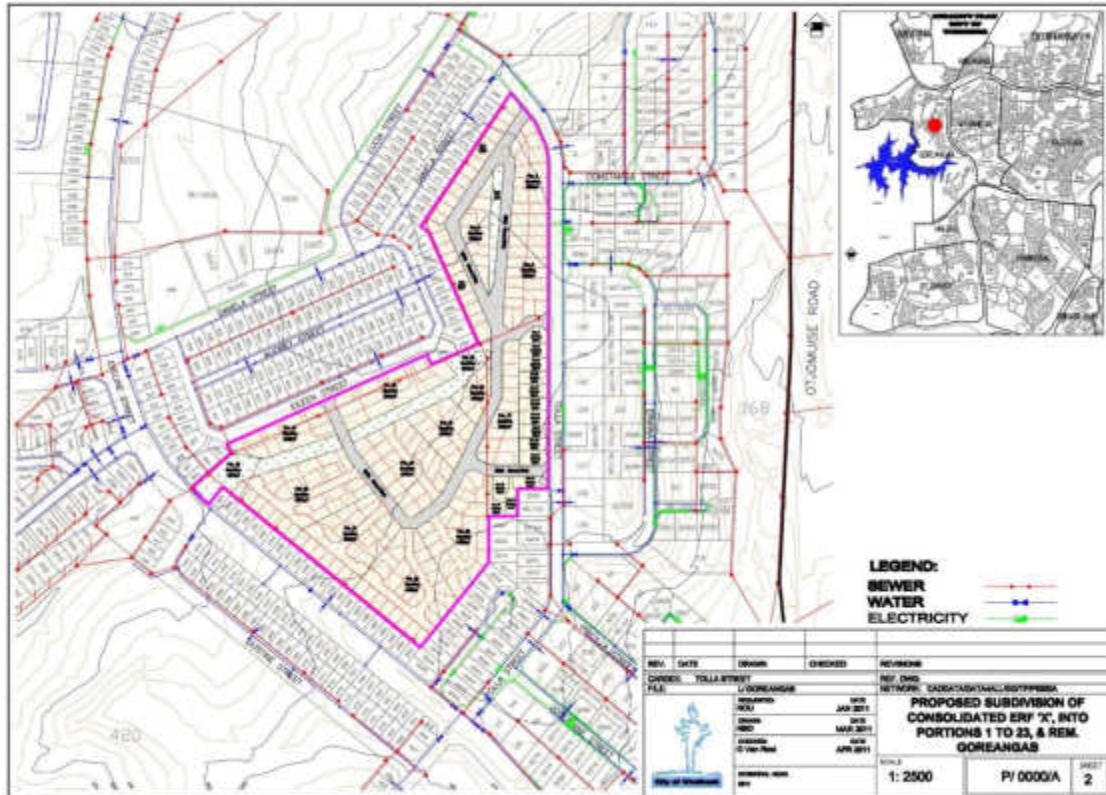


Figure 11. The proposed new layout of Greenwell Matongo D Informal Settlement.

4.5 Okahandja Park D

4.5.1 Description of the Proposed Activity

The division of Sustainable Development on behalf of City of Windhoek intends to obtain approval from NAMPAB and the Townships Board for the subdivisions, closure, rezoning and consolidations of E, Erf 3879, Erf 3318 & R/3275, Okuryangava. Subsequent subdivision of the newly created portion (Erf Z) and rezoning of newly created 33 erven to suite the proposed land-uses is concurrently applied for.

4.5.2 Locality and surrounding Land Use

The Okahandja Park D Informal settlement is situated in the low income area far north of Windhoek on the outskirts of Okuryangava, Extension 6. It borders the Okahandja Park A, B & C settlements to the south, Frans Indongo Primary School to the north, Kilimanjaro & Babylon Informal settlement areas across Omuvapu Road to the west and the Brakwater service road “D1491” to the east. The area is accessible from the Brakwater service road “D1491” from the east and Omuvapu Road from the west.

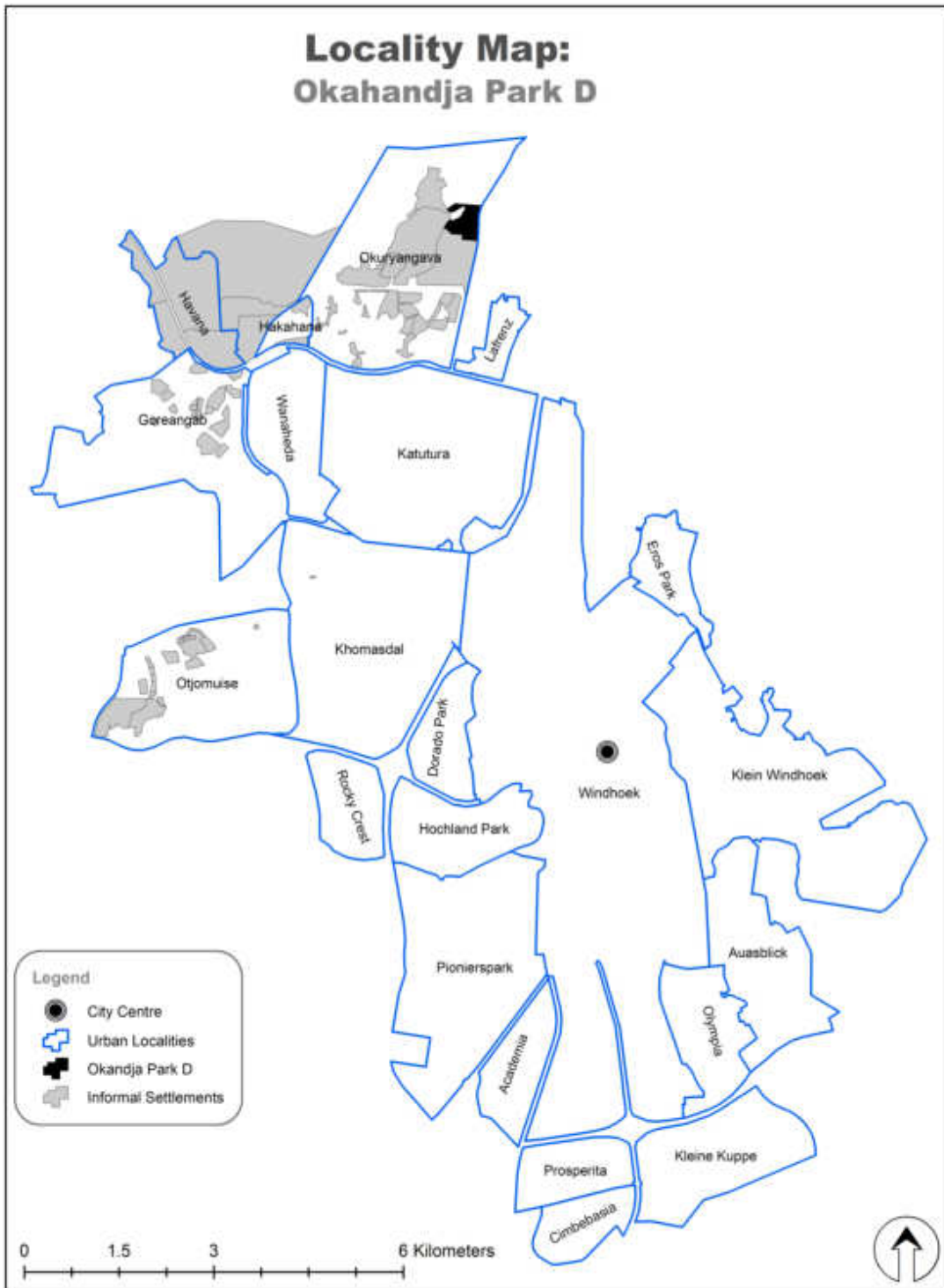


Figure 12. Locality map of Okahandja Park D

4.5.3 Land Ownership

Erven 3879, 3318 and R/3275, Okuryangava are owned by the City of Windhoek and currently zoned “Residential” with a density of 1:300, “General Residential” with a density of 1:150’ and “Public Open Space” respectively.

4.5.4 Project Rationale

The Okahandja Park D informal settlement is one of the numerous informal settlement groupings found in Windhoek that requires upgrading in order to improve the living conditions of the residents. A Socio Economic Survey conducted in 2007, clearly identified the urgent need for adequate and affordable services, land and housing and as such it is imperative that the informal settlement be regularized and upgraded to effectively address the needs of its residents. The proposed formalization would address the scarcity of land and as the people are already resident in the area and wishes to stay there it would thus be ideal to introduce a planning intervention that is not only beneficial to the CoW, but also for the residents of the settlement.

According to the City’s records there are a total of 500 households with a population of 2400 people. A massive influx have however taken place since the Socio Economic survey was conducted in 2008 and a high number of households need to be relocated to alternative sites in order to make room for the upgrading of the area.

Due to the low level of services upgrading of the area was deemed necessary and desirable in order to improve the living conditions of the inhabitants. Hence, the rezoning and proposed township development will result in the creation of more than erven, and EIA in accordance with the Environment Management Act 7 of 2007 is required.

4.5.5 Current and Proposed New Land uses

The settlement area would become a permanent feature hence planning will create mixed land-uses to cater for all social and economic needs presented in the area. The following land uses will be provided after the reorganization of the

households and will form part of the overall upgrading process.

4.5.5.1 Current Land uses

The area has three communal prepaid water points catering for about 500 households. Households that were settled north of the temporary site have been provided with two communal water standpipes and waterborne toilets. There are currently no sewer connection or sanitation facilities available, but a 150mm-diameter sewer line runs north of the settlement and link up to the main municipal services close to the Brakwater service road that can be used for future connections. There is no connection to electricity but a high mast electrical light was erected in 2007, for lightening purposes only.

4.5.5.2 Proposed Land Uses

- The development delivers fifteen (15) residential block erven, which are provided to accommodate households within the area that cannot afford individual erf, and may instead prefer to lease sites, or buy block erven as part of a saving group. The block erven will be subdivided into sites of approximately 150m². It will be zoned “General Residential” with a density of 1 dwelling unit per 150m².
- Fourteen (14) erven to be zoned “Single Residential” with a density of 1 dwelling unit per averaged 300m² are provided to accommodate households who can afford to purchase such residential erven.
- Three (3) Public Open Space erf to accommodate functional playground
- One (1) erf zoned Street Remainder to facilitate ease of access to all newly created erven. The Remainder will be reserved for “*Street*”

A total of 33 erven of various sizes and zoning will be created from the proposed subdivisions of Erf ‘Z’ in order to create a conducive living environment for the inhabitants of Okahandja Park settlement. See table on the following page for details:

Table 6. The Erf and Site Yield of Okahandja Park D:

	Total No. of Erven	Total Area (approx.)
General Residential – 1:150 m ² (Block Erven)	15	9,1492 Ha
Single Residential	14	8.316 Ha
Public Open Space	3	5,2285 Ha
Remainder street	1	1,4154 Ha
TOTAL	33	19,1307 Ha

4.5.6 Proposed Services

Provision of the following services will be considered during the upgrading and formalisation of the area.

i) Water

The proposed development will provide individual water connection to all erven. The bulk services will be extended within the Block residential erven to provide access to informal residential sites. Households that prefer to remain in a communal setup for access to water will be assisted to agree to the number and positions of standpipes.

ii) Sewer

Existing sewer networks will be extended to provide access to all erven. Households accommodated on informal blocks will have access for individual sewer connection. The construction of toilets will remain the responsibility of the households.

iii) Electricity

The area currently has no access to Electrical services; there is however electricity bulk services close to Okahandja Park D and provision for connections to all erven will be done during the upgrade.

iv) Roads

The Roads Authority granted approval to allow access from the District Road “D1491”. This informal road will be upgraded to a 15 meter wide collector road connecting the Brakwater service road “D1491” and Omuvapu Road. Residential block erven will have 8 meter wide one way access ways that connect to 10 meter wide Local Residential roads.

v) Fire Hydrants

The Okuryangava Reservoir serving the Okahandja Park development with water is in close vicinity and therefore not high enough (floor level of 1688m) to service the entire development with sufficient water pressure according to the design standards used by CoW. Sufficient pressure is needed to make some household appliances function normal and certain amounts of flow needed to facilitate firefighting in case of a fire emergency.

It is for the above reasons that the entire proposed area cannot be serviced at once. Erven located on areas above the 1673m contour (10m lower than the reservoir floor level) should not be sold but only leased at this stage since these areas cannot be serviced with sufficient water pressure. In future, this area will be linked to the Lafrenz Reservoir which will provide sufficient water pressure due to its higher location. This future link is dependent on the development of private land (Trustco Hills) between the Lafrenz Reservoir and this proposed development. No specific development timeframe is known at this stage for this private development. As can be determined from the Socio-Economic Survey, a high number of households use inflammable substances on a daily basis for cooking and lighting and this thus make Okahandja Park D a fire risk prone area. It is however advised that at least a few strategically placed Fire Hydrants be erected to enable the City’s Emergency Management Response unit to provide firefighting services.

4.5.7 The Layout

The revised new layout plan for Okahandja Park Informal D Settlement is shown in figure 13.

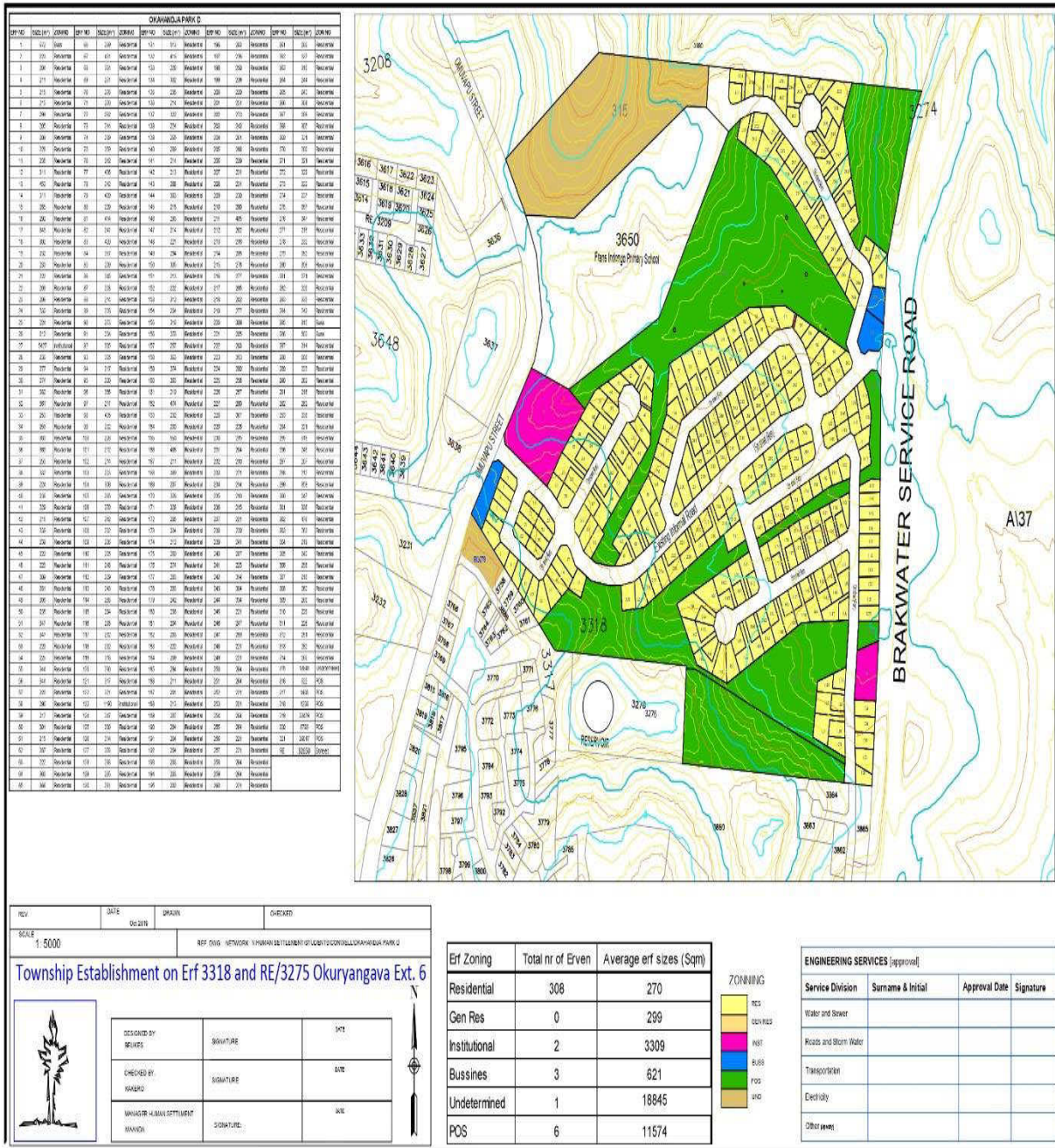


Figure 13. The revised layout plan for Okahandja park D.

4.6 Freedomland A and B

4.6.1 Description of the Proposed Activity

Freedom Land A consist of erven 1747, 1750, 1751 and 1335, Okuryangava with a total size of 18 705 m², while Freedom Land B consist of Erven 1740, 1745, 1746 and 1748, Okuryangava with a total size of 24 930 sqm; both settlements are located in Okuryangava Extension 3. Freedom Land A and B has been inhabited by informal settlers before 1990. The zonings of the erven is provided in the Table 7 below

Table 7. Current zonings of Freedomland A and B

Township	Erf Number	Size (± m²)	Zoning
Freedom Land A	1747	6627	Institutional
	1750	4148	Public Open Space
	1751	2820	General Residential 1:100
	1335	809	Undetermined
Freedom Land B	1740	19 215	Public Open Space
	1745	2711	Institutional
	1746	3004	Undetermined
	1748	5110	Institutional

This area was upgraded in accordance to Development and Upgrading Strategy which provided 4 General Residential block erven, 88 Single Residential erven and one Institutional erf at Freedom Land A and 5 General Residential block erven, 89 Single Residential erven, 4 Public Open Spaces and one Institutional erf at Freedom Land B.

The zonings for Erven 1747 and 1751 of Freedom Land A will stay the same, while Erf 1335 will be rezoned from Undetermined to Institutional and Erf 1750 to be subdivided into Residential and Public Open Spaces before it is rezoned

accordingly. At Freedom Land B, zonings for Erven 1740, 1745 and 1748 will stay the same, while Erf 1746 will be rezoned from Undetermined to Residential. This will be followed by a township establishment application to NAMPAB.

4.6.2 Locality and Surrounding Land Use

The Freedom Land A and B Informal Settlements are located in the northern informal settlements of Windhoek. Freedom Land A is situated on Erven 1747, 1748, 1750 and 1751 and Freedom Land B is situated on Erven 1740, 1745, 1746 and 1748 in in Okuryangava Extension 3 some 7 kilometres to the north of the City Centre. The location is best appreciated in figure 14 below.

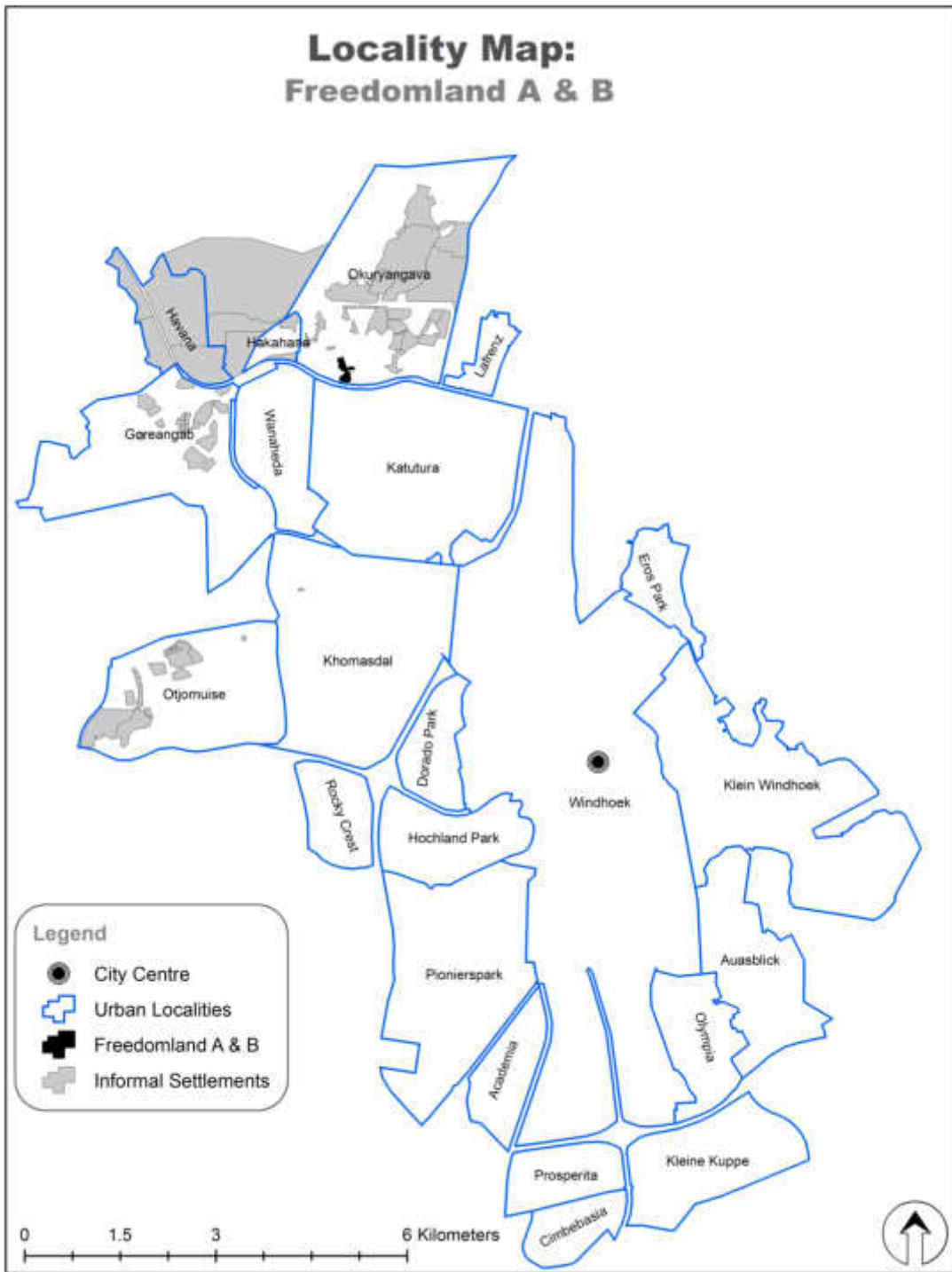


Figure 14. Location of Freedom Land A and B Informal Settlement

The area surrounding Freedom Land A and B Erf is predominantly by single “Residential” zoned erven. Other land use zoning such as “Public Open Space”, “Business”, “Institutional” and “Municipal” also exist.

4.6.3 Land Ownership

The CoW owns the erven that constitutes Freedom land A and B Informal Settlement.

4.6.4 Project Rationale

The continuous inflow of people to the informal settlements has resulted in an increased proportion of the urban poor who lacks basic services at acceptable convenience levels and land tenure security.

The Socio-economic Survey done by the CoW, indicates that Freedom Land A and B informal settlement required upgrading in order to improve the living conditions of the local inhabitants. Like many other un-planned settlements, the general living condition of people residing in Freedom Land A and B was below acceptable level and as such immediate intervention of the CoW through informal settlement upgrading programme was called for.

The pressing situation which the people of Freedom Land A and B informal settlement found themselves in (paired with - local, regional, national and international goals on improved living conditions) justified the need and desirability for the upgrading of the said informal settlement. This upgrading was done in 2010.

4.6.5 Current Land uses

The land use before the upgrading programme and after the upgrading programme is described below.

4.6.5.1 Land use before Upgrading Programme

At the start of the Freedom Land A and B informal settlement upgrading project in 2007, there were 175 households, 2 communal toilets and 2 communal water points at Freedom Land A and 207 households, 2 communal toilets and 2

communal water points at Freedom Land B. There are also churches, kindergartens and the general level of services was very poor. Refuse removal was provided through the use of black plastic and skip containers. The black plastic bags are collected weekly for disposal at Kupferberg landfill site.

In light with the above, and as part of the upgrading drive, deliberate effort was made by the CoW to improve the level of services and proposed new land uses.

4.6.5.2 Land use after Upgrading Programme

The CoW proposed the new land uses which was implemented during the upgrading process, in 2010.

Erf 1335 of Freedom Land A will be rezoned from Undetermined to Institutional and Erf 1750 to be subdivided into residential and Public Open Spaces before it is rezoned accordingly. Erf 1746 of Freedom Land B will be rezoned from Undetermined to Residential, and as such an EIA with in accordance to with the Environment Management Act 7 of 2007 is required.

The following new land uses, infrastructure and services were implemented for Freedom Land A and B:

i) Erven

- Four “*General Residential*” zoned erven in Freedom Land A and five “*General Residential*” zoned erven in Freedom Land B with a with a density of 1 dwelling unit per 150m². These erven would consequently be subdivided informally into sites of approximately 150m² by the group members.
- 88 “*Residential*” zoned erven in Freedom Land A and 89 “*Residential*” zoned erven in Freedom Land B with a density of 1 dwelling unit per 150m².
- One “*Institutional*” zoned erf in Freedom Land A and One “*Institutional*” zoned erf in Freedom Land B is provided to accommodate an existing kindergarten and church.
- Four “*Public Open Space*” zoned erf in Freedom Land B is provided.

Sizes and yield are indicated in the table below.

Table 7. Erf yield for Freedom Land A and B

	Freedom Land A	Freedom Land B
General Residential (Block Erven)	4	5
Residential	88	89
Public Open Space	-	4
Institutional	1	1

ii) Water

Water reticulation system is available for individual connections. The water stand pipes were demolished.

iii) Sewerage and wastewater disposal

Sewerage system was installed which drains to the Gammams Wastewater Treatment Plant. The communal toilets were demolished.

iv) Roads and access

Due to the fact that the upgrading project took place in situ and coupled with the high densities of the areas before the upgrade, only 8 meter wide streets could be designed. It was determined that the tarring of the streets is not advisable as the utility services that may need maintenance in future are located within these narrow street reserves; the only surfacing option for the narrow streets is thus paving.

v) Electrical services

Bulk services available, individual connections possible.

vi) Solid waste collection and disposal

Refuse removal is provided through the use of black plastic and skip containers and were collected weekly for disposal at Kupferberg landfill site.

4.6.6 The Layout

The layout plan for Freedom Land A and B is shown in Plan P/4081/A.

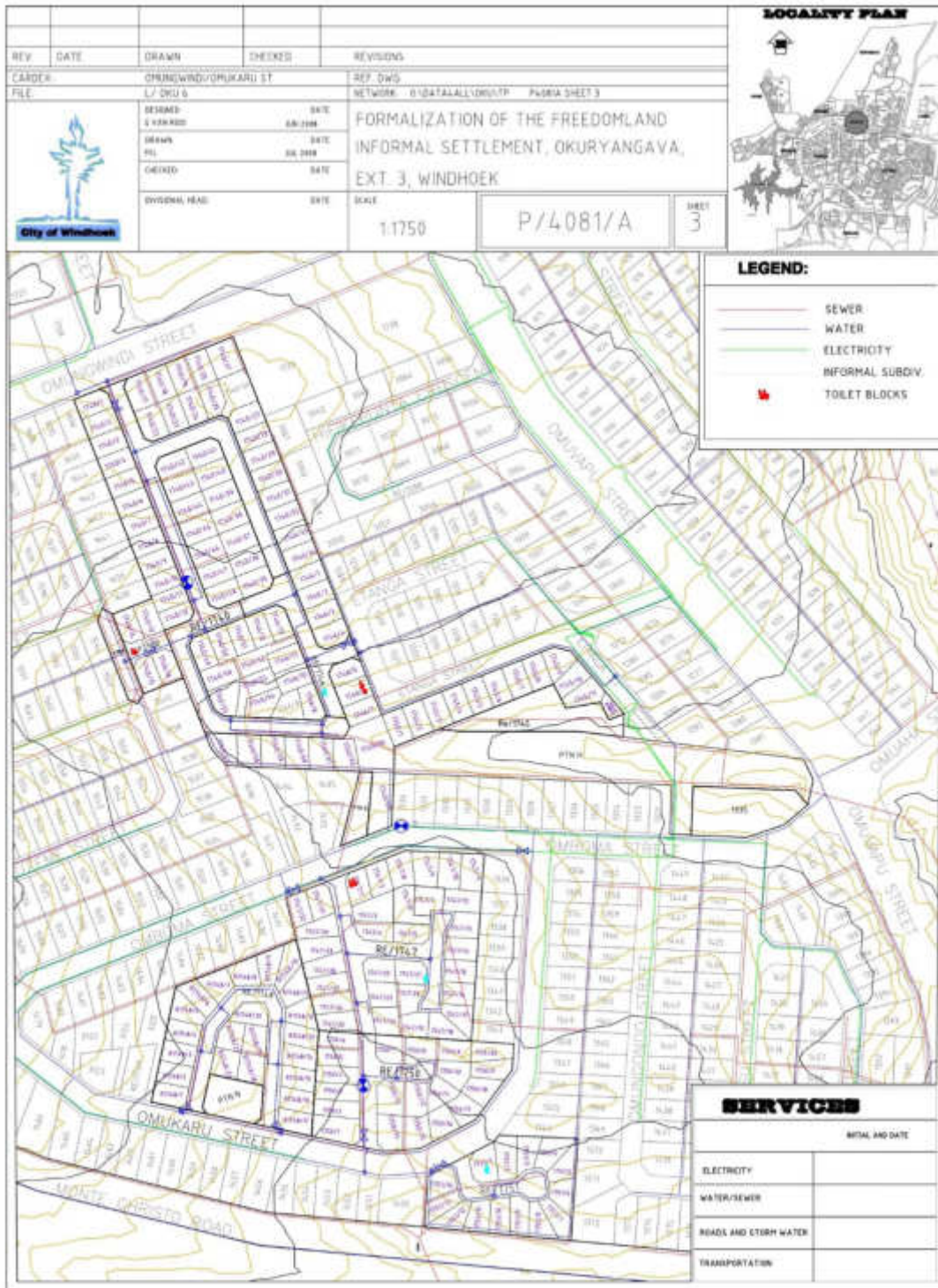


Figure 15. The layout plan for layout plan for Freedom Land A and B

5 THE AFFECTED ENVIRONMENT

5.1 Climate

Classification of climate	Semi-arid highland savanna
Long-term annual mean rainfall	300-350 mm per year
Precipitation	Sporadic and unpredictable, high intensity, highly localised storm events between October and April.
Temperature	During the hottest month of the year, which is mainly December, the average maximum temperature is about 30-32 °C. During July which is the coldest month the average minimum temperature is 4-6 °C.
Humidity	The relative humidity during the least humid months of the year (i.e. September and October) is around 10-20% and the most humid month is March with 70-80% humidity. Namibia has a low humidity in general, and the lack of moisture in the air has a major impact on its climate by reducing cloud cover and rain and increases the rate of evaporation.

5.2 Topography

The geology of the central Namibian region is dominated by the Damara Sequence. The site is underlain by pre-cambrian aged meta-sedimentary strata of the Kuiseb Formation of the Damara Sequence. The Kuiseb Formation comprises of a more than 6000m thick succession of mica schist, graphitic schist, marble and quartzite. The main rock type is identified as biotite schist, but with minor strata of micaceous quartzite, feldspathic schist and amphibole schist (Labuschagne, 2004, and Mendelsohn, et al, 2002).

The soil cover in the study area is largely shallow and has been derived from the underlying lithologies and is classified as 'leptosol' (Mendelsohn, et al 2002)

referring to shallow soil cover overhard rocks. 'Leptosol' dominate the entire project area.



Figure 16. Northern informal settlement

5.3 Geology and Soils

The geology of the central Namibian region is dominated by the Damara Sequence. The site is underlain by pre-cambrian aged meta-sedimentary strata of the Kuiseb Formation of the Damara Sequence. The Kuiseb Formation comprises of a more than 6000m thick succession of mica schist, graphitic schist, marble and quartzite. The main rock type is identified as biotite schist, but with minor strata of micaceous quartzite, feldspathic schist and amphibole schist (Labuschagne, 2004, and Mendelsohn, et al, 2002).

The soil cover in the study area is largely shallow and has been derived from the underlying lithologies and is classified as 'leptosol' (Mendelsohn, et al 2002) referring to shallow soil cover overhard rocks. 'Leptosol' dominate the entire project area.

5.4 Groundwater Resources

Kuiseb Formation (Swakop Group) rocks forms the bedrock geology of the area. The dominant lithologies are biotite schist and quartz biotite schist. Surficial deposits are generally thin to very thin over much of the area. Along the larger drainages, some alluvial deposits (about 1 m) have developed.

Structures present are north-south and northwest-southeast faults and joint systems as indicated in Figure 8 below. To the south of the City, north-south normal faulting of the brittle Auas Formation quartzite is responsible for the development of the high yielding Windhoek aquifer. The north-south fault systems extend to this area and affect the Kuiseb Formation rocks. These faults are less developed in the micaceous lithologies as the mica schist undergoes plastic deformation. The major faults are shown in published geology maps and are often marked by north flowing ephemeral streams.

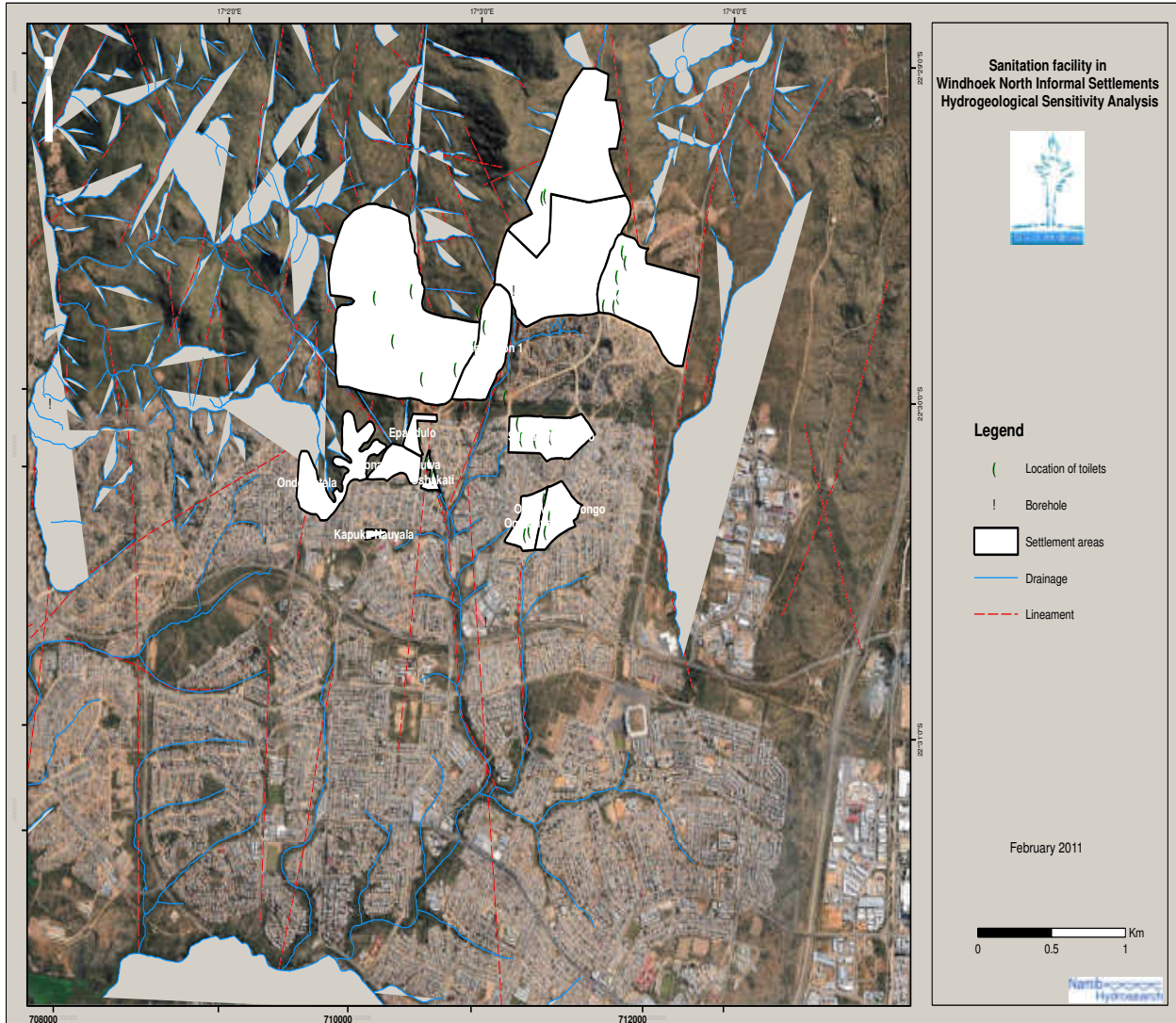


Figure 17. Aerial photo mosaic of the study area with digitised lineaments and drainages. Note that details are obscured in the built up areas.

5.5 Topography and Drainage

The informal settlement area is located in an elevated area with south and north flowing ephemeral streams draining the area. The north flowing streams in the central part of the study area flow into the Aretaragas River. The south flowing streams merge and flow in the Goreangab Dam to the south west of the area. In the absence of any sanitation facilities in the informal areas, it is conjectured that the effluent from the area currently enters the drainage system and is removed downstream by surface flow.

6. SUMMARY OF SPECIALISSED STUDIES

This section present a summary of the specialised study of Biophysical Environment, Groundwater Studies and Socio-Economic Environment. The complete reports are attached separately as Annexure 1, 2 and 3.

6.1 Biophysical Environment

This section present a summary of the specialised study of Biophysical Environment. The complete report is attached as Annexure 1.

6.1.1 Flora

In the central highlands the vegetation is classified as highland savannah and comprises a number of Acacia species and numerous species of perennial thorn trees in the valleys and shrubs and grass on steep slopes (Lawrence, 1971). According to Giess (1971), this area is classified as Highland Savanna vegetation type. This vegetation type is mainly characterised by trees such as *Combretum apiculatum* and Acacia species (such as *Acacia reficiens*, *A. hereroensis*, and *A. erubescens*). The grass in this vegetation type mainly comprises of the climax grasses such as *Antheophora pubescens*, *Brachiaria nigropedata*, *Digitaria eriantha* and many other species.

About a 100 grass species are expected to occur in the area. The species of conservation importance include: endemic (*Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finite*).

6.1.2 Fauna

With regards to fauna, there was no evidence of medium to large sized mammals, given that the proposed are fall in a disturbed area. Presence of mammals are likely to occur at the proposed site.

Mammals

There is at least 250 species of mammals in Namibia. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. The most common endemic

mammals include the rodent family Petromuridae (Dassie rat) and the rodent genera Gerbillurus and Petromyscus.

The following table indicates mammal species were known and/or are expected to occur in the general area surrounding the project area.

Birds

Namibia has about 658 species of birds (Barnard, 1998). High diversity of bird species in the study area is expected to occur in river courses. The highland savanna in which the study area is, have relatively high diversity of birds. This is probably because of the fact that the highland savanna vegetation type is at the interface of the Kalahari to the east, Karoo to the south, thorn bush savanna to the north and escarpment to the west. Birds from all these biomes and vegetation types occur around the highland savanna. More than 230 species of birds are expected to occur in the study area (Barnard, 1998).

Amphibians

According to Griffin (1998) only anuran amphibians (frogs and toads) are found in Namibia. Namibia has about 50 frog species on record. The dependence of frogs to surface water for breeding limits most species of frog in Namibia to the five perennial rivers and more reliable seasonal sources. Despite this many species in Namibia are arid-adapted and occur throughout the country. About 9-12 species of frogs is expected to occur in the study area (Griffin, 1998).

Reptiles

There are about 261 species (56% of the Southern African region's species diversity) of reptile expected to occur in Namibia (Barnard, 1998). 71-80 species of reptiles are expected to occur in the project area (Barnard, 1998).

6.2 Groundwater Studies

This section present a summary of the specialised study of Groundwater Studies. The complete report is attached as Annexure 2.

6.2.1 Topography and Drainage

The informal settlement area is located in an elevated area with south and north flowing ephemeral streams draining the area. The north flowing streams in the central part of the study area flow into the Aretaragas River. The south flowing streams merge and flow in the Goreangab Dam to the south west of the area. In the absence of any sanitation facilities in the informal areas, it is conjectured that the effluent from the area currently enters the drainage system and is removed downstream by surface flow.

6.2.2 Hydrogeological Conditions

In the area borehole information is scarce and only four (4) partial borehole records were located. From adjacent areas it is known that the fractured Kuiseb Formation mica schists form low potential aquifers often with poor quality water. Yielding boreholes appear to be associated with the north-south structures and drainage channels.

The fractured micas schist do not form aquifers of the same potential as in the fractured quartzite Windhoek aquifer to the south and the area is classified as having low potential. Generally, groundwater (and surface water) flow is northwards.

The study area has undulating terrain with elevation differences of 20-30m being common (**Figure 9**). The depth to water table is thus variable from being deep in elevated areas to shallower in the larger valleys.

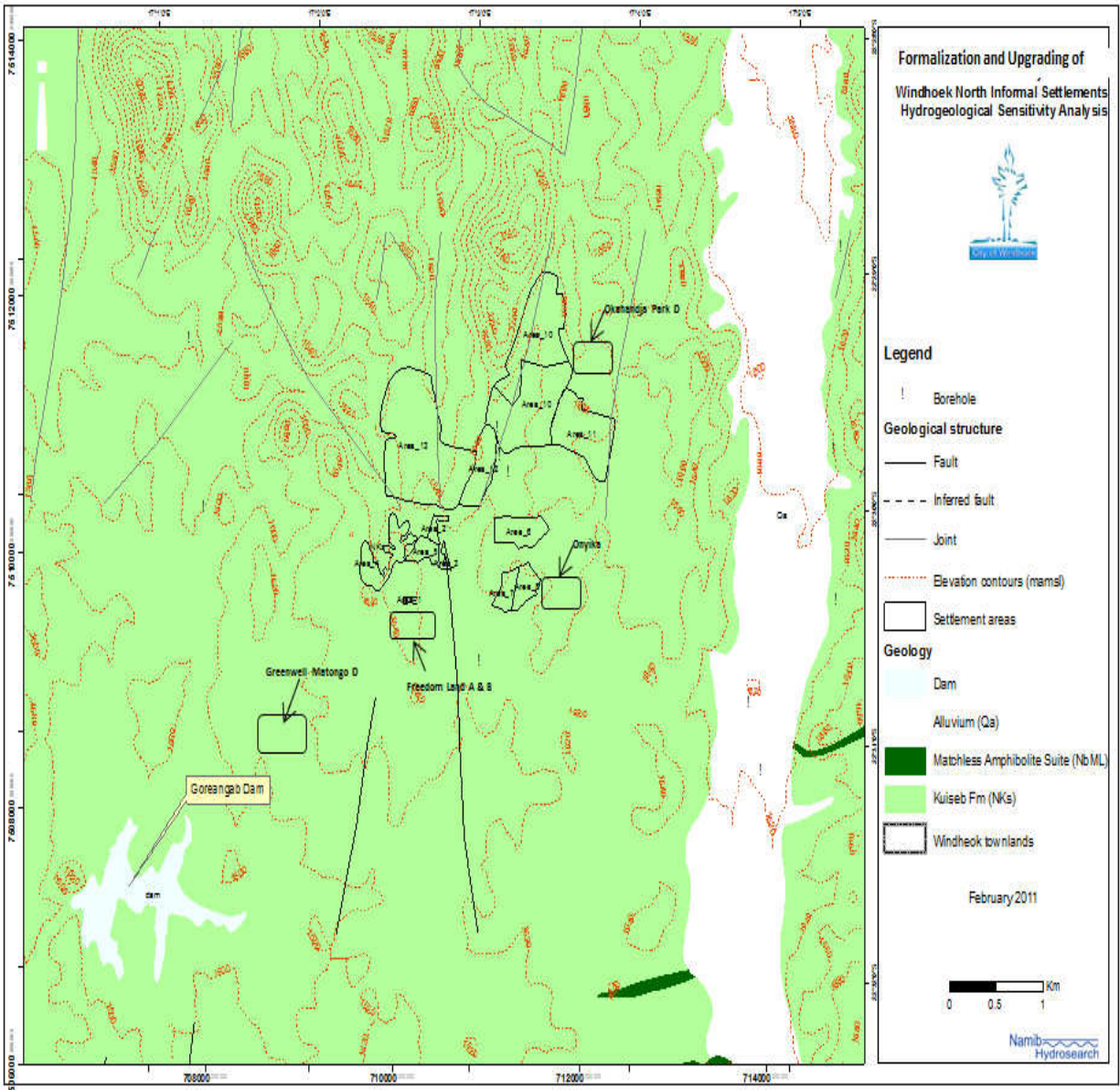


Figure 18. Study area shown on digital elevation data: Major drainages and Goreangab Dam shown in relation to the project areas.

6.2.3 Recharge

Barbour (1997) commented on underground water resources in Windhoek, that direct and indirect recharge from rainfall through precipitation and run-off over quartzite outcrop areas can reach the water table by infiltrating fractures, joints or bedding planes or via any large outcropping fault zone in the vicinity. Other recharge routes are via fault zones, which cut the surface in schist outcrop areas.

Barbour (1997) further comments on the pollution threat as follows: *When assessing the pollution threat to the underground water resources posed by development on surface, the danger is as a result of the production of contaminating waste substances on surface which can be mobilised by water from rainfall or from any other source, and reach the water-table”.*

6.3.4 Key Findings

The underlying lithology consisting of quartz-biotite schist has relatively low infiltration capacity and is not necessarily capable of high groundwater yields but where dissected by faults and numerous fractures form conduits for groundwater recharge. The groundwater resource is not presently used in the area, it is tapped further to the north by numerous smallholders and farmers, and surface drainage flows into the Aretaragas River or Goreangab Dam (which is to large extent already polluted). The soil, examined in a nearby area, is known to have low capacity to retard organic pollutants.

As such, effluent infiltrating from surface will pose a threat to users to the north or surface water bodies and effort should be made to prevent pollution and not further deteriorate the current condition of the surface water bodies. The drainage in the area is part of the Swakop River catchment and eventual pollution of surface water bodies such as the Swakopoort Dam is possible from this source. It should also be noted that the DWAF borehole database hasn't been regularly updated and that the number of boreholes down gradient of the area could be much higher.

In order to aid design of a safe sanitation system and sewer network the area has been classified into 3 Zones while the drainage system has been identified as vulnerable to illegal surface waste and pollutants:

- Zone 1 – where no leakage of effluent is permitted, extends 50m on either side of areas where streams and faults (lineaments) coincide and within a 20m strip on either side of lineaments (**Figure 10**).
- Zone 2 – where effluent discharge poses a lesser threat. This zone extends from the boundaries of Zone 1 to 50m away on either side from the lineaments (**Figure 11**).
- Zone 3 – areas not classified as Zone 1 or 2.

- Drainage – the drainages and immediate surroundings are classified as vulnerable to dumping of wastes, leakage from sewer systems and informal lavatories (**Figure 19**).

Zone 1 areas is expected to have higher infiltration rates, particularly in times of high precipitation and surface water flow. In these areas effluent and other pollutants should not to be allowed to be discharged. In Zone 2, the ground is characterised by less infiltration potential and possibly thicker unsaturated zone but is in almost all cases immediately up slope of the higher risk Zone 1 and therefore it is important that protection measures are adhered to. The drainages require protection as discussed above. The south flowing drainage flows into the Goreangab Dam while those draining north drain into the Aretaragas River and pose a risk to downstream fresh water resources.

The proposed sewer network and sanitary systems should be implemented as a matter of priority to avoid pollution of surface water and groundwater resources in the area and downstream of the area.

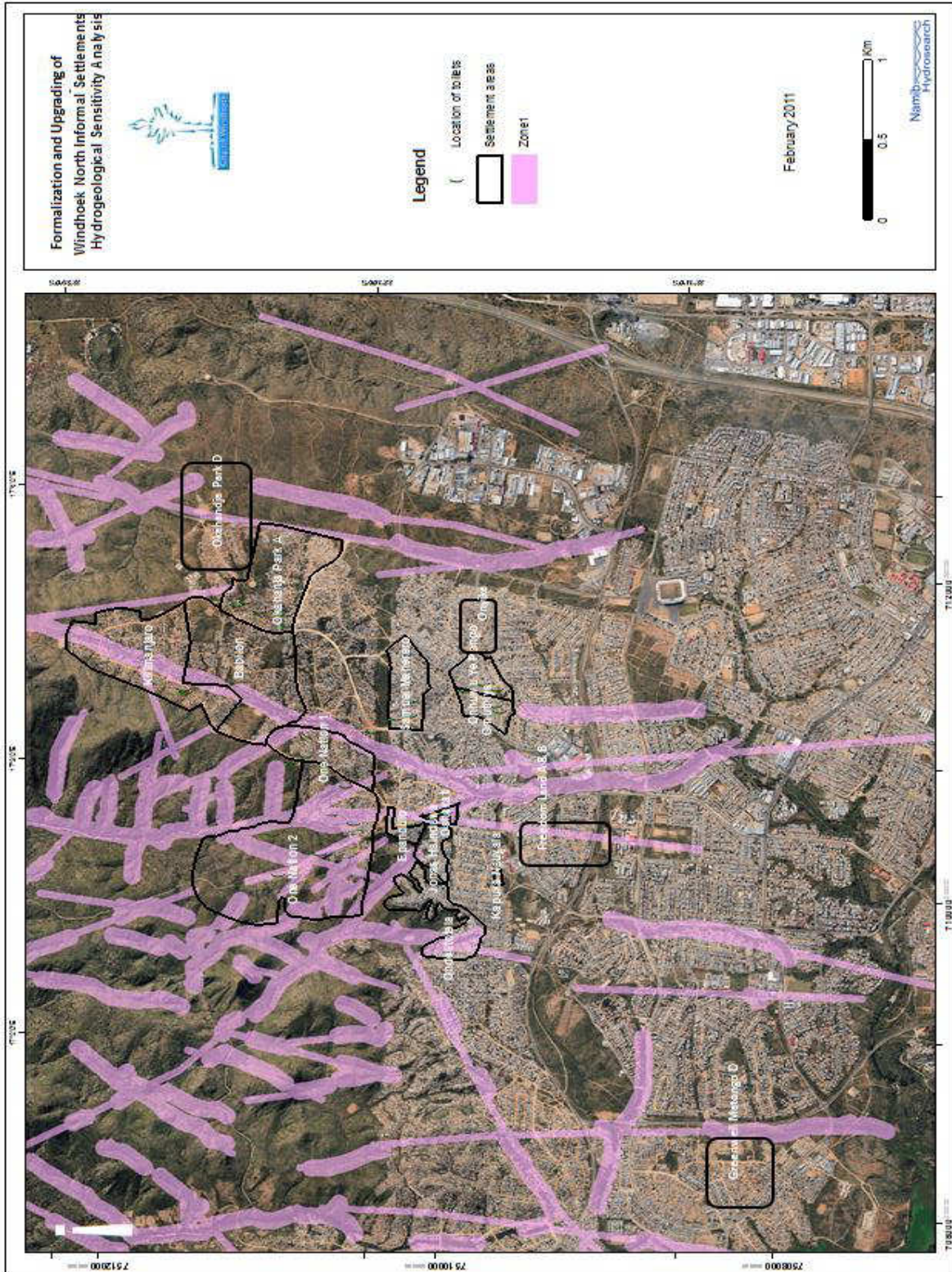


Figure 19. Zone 1 area: no leakage of effluent is permitted

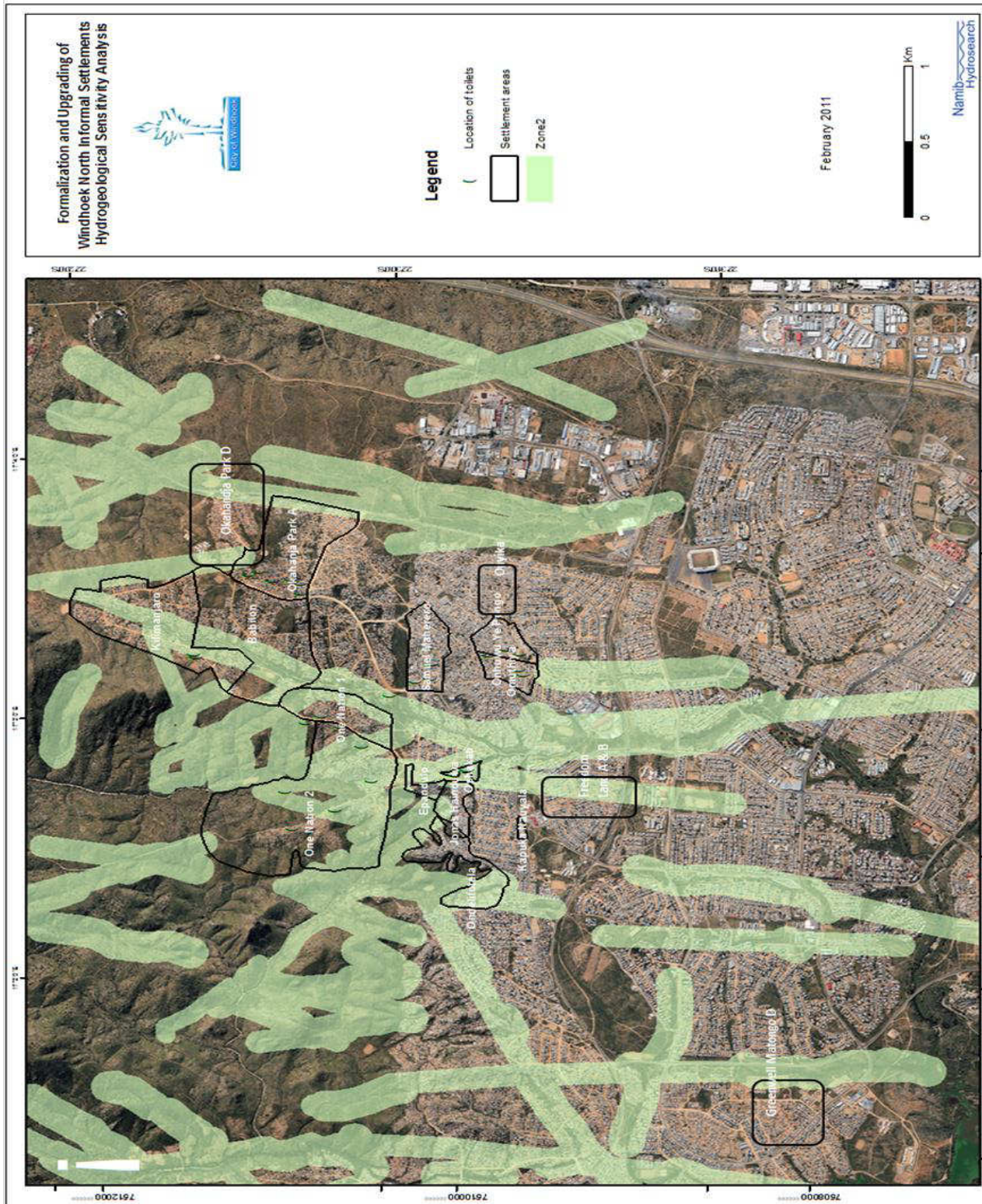


Figure 20. Zone 2 areas: where effluent discharge poses a lesser threat but areas mostly are up slope of the higher risk Zone 1.

6.3 Socio-Economic Environment

6.3.1 Socio- Economic Environment in Informal Settlement

These sections present a summary of the specialised study of Socio Economic Environment. The complete report is attached as Annexure 3.

Windhoek is experiencing the highest rural-urban migration rate in Namibia. The harsh reality is that the population in informal settlements has grown from 28,000 to 48,183 amounting to 9.46% growth in the informal settlements since Namibia's independence in 1990 until the year 2001 (CoW 2005).



Picture 2. A lady on her way to fill up 25 litre containers with water from a communal water standpipe in informal settlement.

6.3.2 Key Findings and Recommendations

The key findings of the social impact assessment were:

- The assessment has found that the urgency for the services in the informal areas has translated into swift project implementation that in turn has caused the public participation process to be neglected.

- The community consultation process has revealed that the quality of the some of the equipment installed during the project had social acceptability shortcomings and that some equipment used are not of a desired required standard.
- The assessment has found that the need and the demand for basic services in these areas are beyond what the CoW could provide.

The key recommendations of the social impact assessment are:

- The CoW should not view community participation as only part of the requirement for environmental assessments (EA), but as an integral part of community development. The lessons we can learn from the present service provision project points to the need of embracing a **'sustained community participation model'** that could help inculcate not only community ownership aspect or requirement but also aid the long term sustainability of the CoW service provision programmes.
- The assessment team investigated the present conditions in the informal areas of Agste Laan and the Negende Laan areas, although that was outside the present Terms of Reference, has discovered that the lessons learnt and the methodology that are being applied has relevance to the above areas. The approach in the above areas could focus clearly on the strengthening of **'local settlement management committees'** to strengthen community participation and responsibility regarding the future planning processes. current intervention to effectively direct the provision of future services.
- City of Windhoek management should periodically inspect the sewer servitudes to ensure that the servitude is being properly maintained by the maintenance team. Property owners should receive adequate notification of routine maintenance. Care should be taken by maintenance teams not to damage private infrastructure, and access should be restricted to roads agreed to by property owners.

- The CoW divisions has a clear recognition of the value and importance of the present Project and the future potential and significance of Public Private Partnerships (PPP's) as a future sustainable urban development model. A CoW division has requested the assessment team that the success of this project is the premise of future public discourses and engagement that could culminate in a (Dedicated Stakeholder Workshop on developing Funding Formulas based on PPP principles) aimed at bringing on board multilateral stakeholders / development partners.

6 PUBLIC PARTICIPATION

6.1 Public Participation

The public engagement requirement is contingent on the recognition that any project can only succeed if the cost recovery is economically feasible and thus a proper assessment study needs to be done by suitably qualified business development expert in collaboration with the proponent.

Under normal circumstances the public participation process precedes the actual development interventions, the latter approach is critical especially when the envisaged interventions are to be owned, managed and maintained by the community members. The team has found that the public participation process lacked behind the actual construction process and the community members lamented the practise that services were being installed without prior communication and notice in their areas. Those bringing the services were perceived as being reluctant to share information with community members as they feel they as construction workers are not responsible for the public consultation processes.

7.2 Methodology

The EIA consultants were introduced to the Tobias Hainyeko Constituency Councillor who is the responsible political office bearer at the EIA contract inception. The team met the Councillor Mr. Zulu Shitongeni who also was responsible for the Moses //Garoëb Constituency as the responsible Councillor was on sick leave. The EIA consultants accompanied the Municipal Councillors on 5th November on a familiarisation tour of the serviced sites in the two constituencies.

The assessment team met the two constituency development committees at information meetings on the 10th and 20th November respectively. These committees and community members were consulted through public meetings

and on the basis of individual consultations. The main objective of these meetings was to inform the communities on the objectives and status of the services provision.

The following community groups, companies and individuals were consulted:

- Tobias Hainyeko Constituency Development Committee members, 10 & 20 November.
- Moses //Garoeb Constituency Development Committee members, 10 & 20 November.
- Betcrete Nam and Namibia Sanitary Solutions, Mr. Jackie Visagie, 4th December.
- Open public information meeting on the 4th December



Picture 3. Site visits and community consultations were used to gain community concerns about the intended provision of water and sewer services.

6.3 Purpose of Public Participation

The main purposes of the EIA and more specifically the process of public participation is to obtain issues of concern which have potentially significant impacts on the socio-economic and biophysical environments, and if project alternatives are available that are more beneficial, or conversely if the negative impacts can be minimised or mitigated to acceptable levels. It is important to bear in mind that potential impacts can be positive or negative, and mitigation measures applied are then either to minimize negative, or enhance positive, impacts.

This EIA process takes cognisance that services were being provided simultaneously as the EIA study was being carried out. Thus mitigation measures being proposed are for post-implementation phase. Largely the assessment will provide lessons learned, applicable to the further development of the informal settlements in the CoW. Thus recommendation will be made for future EIAs and upgrading of informal settlements.

Officials within the CoW welcomed the Government intervention as ideal practice that should have been implemented earlier. The officials admitted that the rapid development of informal settlements have overtaken and constrained the capacity of the City Council to provide essential services such as sanitation, access roads, electricity, sewer and water reticulation services to the residents of informal settlements. Some officials also admitted that the limited time scale of the services roll-out over 13 informal settlements could influence the decision regarding the quality of the present project.

6.4 Issues and Concerns Raised

6.4.1 Main concerns with Water Standpipes –

- The Efteq pre-paid water standpipes provided under the current project appears to have poor quality / maintenance problem which needs review before the finalization of the project.
- The several water standpipes have been reported as not functioning when ambient humidity is high and when temperature is high on rainy days;
- The stand is short, about 600 cm in height, and thus cannot accommodate bigger volume containers such as the 200 litre drum. The current stands are only suitable for the use 25 liter- or smaller containers.
- Plastic pipe on the Efteq pre-paid standpipes is too close to the ground and hence likely to collect dirt.
- A small rectangular cement platform of about 50 cm by 70 cm is built around each water standpipes. Poor drainage around this platform allows

water to form ponds and evidently this can lead to the spread of waterborne diseases.

- Access to water is seen as a persistent problem as many people cannot afford the access-card.



Picture 4. The pre-paid water stand pipe. Note the height of standpipes and water collecting around the stand pipes.

6.4.2 Main concerns with Toilets

- No hand-wash basins installed at the toilet facility and this is not good for general hygiene.
- There is a safety concern as the design of the door leaves open space at bottom of the door through which snakes and scorpions could crawl in.
- Some of the toilets in Omuthiya are placed next to the road and thus limits the users' privacy;
- Toilets in Onghuwo ye Pongo are situated quite far from the houses, hence are not being used at times, the use of it at night remains even a bigger problem.

6.4.3 Public consultation

- The public consultation was welcomed by the interested and affected parties (I&APs). The limited consultations by CoW prior to the project commencement was identified as a concern by the I&APs.

6.4.4 The timing of the EIA process –

- The timing of the EIA raised the question about the relevance and the validity of the EIA process as the provision of services ran concurrently with the EIA. However, the residents appreciated that their concerns were being documented and that with future development of informal settlements or formalisation of townships their concerns will be taken into consideration.

6.4.5 Recruitment of unskilled labourers –

- The absence of local residents in the construction of water standpipes and toilets was seen as a lost of an opportunity for employment, which was blamed on the City of Windhoek perceived poor engagement of stakeholders in the planning and implementation of community projects.

6.4.6 Design and Standards of Services –

- The bulk services design standards and governing laws (water, sewage, electricity-, and solid waste management) were questioned based on current practices and failure from the side of the authorities to ensure efficient operations of the facilities. This was raised with regard to the reality that people are using used newspapers instead of toilet papers, as a cost minimisation exercise, and thus the risk of toilet blockage is high.

6.4.7 Co-management of facilities and Compensation –

- It is expected that the public sanitation facilities will be managed by the residents of the informal settlements themselves, but with the support of the CoW for major repair and maintenance. The residents raised the issue that CoW should consider providing monetary incentives to community members who will be tasked to manage the facilities.

6.4.8 Public Hygiene and Hygiene Education

The sanitation and general public hygiene situation of the informal settlements is deplorable. Flooding during the rainy season aggravates the situation even further.

7 ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATORY MEASURES

Below are detailed descriptions of the various environmental impacts and proposed mitigation measure for construction of services. This is further complimented by the EMP in Appendix D.

The EMP provides guidance in managing and maintaining potential environmental impacts associated with the envisaged construction to a minimum. It is also used to measure compliance by the Applicant. It is this tool that gives guidance during monitoring, auditing and taking corrective actions during its implementation, thereby ensuring continuous monitoring of the environment. It can also be drawn after the authorization by the Competent Authority, to incorporate the conditions of the authorization to reach environmental and social sustainability during project implementation and operation.

Thus the objectives of the EMP is to promote sustainable development by encouraging conservation and mitigating negative significant impacts to the natural and social environments.

7.1 Socio-Economic Impacts

The CoW should not view community participation as only part of the requirement for environmental assessments (EA), but as an integral part of community development. The lessons we can learn from the present service provision project points to the need of embracing a ***'sustained community participation model'*** that could help inculcate not only community ownership aspect or requirement but also aid the long term sustainability of the CoW service provision programmes.

Employment Opportunities

Aspect Description

The development is likely to create job opportunities for the local communities at construction stage. Engagement of local people will improve livelihood for some family members on a short-term basis.

Mitigations

Any job opportunity that may exist at a given time, surrounding communities (both female and male, skilled and unskilled) should be employed as a priority.

Local Economic Activities

Aspect Description

Trading opportunities among the local people is expected to increase to service construction workers. Food stuffs will be sold to construction workers providing a short-term positive addition to the livelihood of the community due to increase in income.

Mitigations

A safe site should be identified to accommodate this informal trading for the construction period.

Increased Demand for Health Services

Aspect Description

During construction, all occupational health related injuries will be referred to contractors and the local health facilities for immediate attention. This will not have a significant impact on the capacity of the staff and facilities to meet the demand for health care.

Worker Safety

Aspect Description

During the construction phase, heavy, machinery will be employed for the clearance of access roads and associated infrastructure, and as such safety and security is a concern. Absence of clear safety guidelines may lead to accidents affecting worker's safety and productivity.

Mitigations

The responsible contractor must ensure that all staff members are briefed about the potential risks of injuries on site. Furthermore the contractor is advised to ensure that adequate emergency facilities, including first aid kits are available. Equipment housed on site must be placed in a way that does not encourage criminal activities. All construction contractors and sub-contractors must be trained in the implementation of effective Health and Safety policies.

7.2 Environmental Impacts

Displacement of people

Aspect Description

Illegal settlement, thus informal housing or infrastructure exist at the project areas and relocation of people is involved.

Mitigations

Relocation of people should be done in an orderly manner and with accordance to relevant policies.

Noise Pollution

Aspect Description

Noise impacts to humans from construction activities will be short-term and will end as soon as construction is completed. However, it is likely that traffic levels would increase in the settlement areas upon completion and usage of new road network, urban infrastructure and activities. Road safety problems may also be experienced by the workforce and residents.

Mitigations

Construction and traffic operations should be limited to the daylight hours to prevent noise inducements at night such as to ensure that the values of residents in the surrounding areas are respected. Noise levels generated by traffic during and after construction should be controlled by appropriate signs and regulations. The construction workers should be provided with all necessary Personal Protective Equipment including earplugs.

Groundwater Pollution and Spillage

Aspect Description

The potential impacts of contaminating both ground and surface water especially during rainy season, to be considered are the possibility of oil and fuel leakages and spillages from the construction machineries and earthmoving equipment's as well as any chemical used during construction. Furthermore, utilization and improper storage of such substances can lead to pollution of the soil or ground water and even health effects.

Mitigations

No direct discharge of liquids of any nature should be made into waterways. Wastewater runoff should be avoided by all means and waste should be kept or stored within the construction area and disposed off properly at a designated or

authorized site. This means that the construction area should be kept clean at all times.

Furthermore, storage of oils, materials, chemicals, fuels etc. to be used during construction must not pose a risk to the surrounding environment. Such storage must be located out of the 1: 100 year flood line of any river and unauthorized access to these areas.

Solid Waste Disposal

Aspect Description

Solid waste such as construction debris, domestic and commercial waste will be generated during and after the construction phase. The non-discretionary disposal of solid waste has the potential to negatively impact the surrounding biodiversity; pollute the air, soil, surface and groundwater; effect the health and safety of residences as well as the aesthetical appearance of the surrounding environment.

Mitigations

The contractor and the city are advised to adopt best practicable environmental practices. This means practices that provide the most benefit or cause the least damage to the environment as a whole as a cost acceptable to the society, in the short and long term. Buildings or infrastructures that are necessary for the functioning of waste management activities should be put in place to integrate and facilitate all waste management services such as waste collection, treatment, recycling and disposal services during and after construction.

Only council approved public waste transfer, treatment and disposal facilities or sites should be used for the recycling of recyclable waste or material, and the temporary storage or final disposal of any generated waste.

Air Quality

Aspect Description

Dust impacts to humans from construction activities will be short-term and will end as soon as construction is completed. The major source of the impact will be dust from front end loaders making access roads and trucks ferrying construction material.

Mitigation

General dust mitigation measures such as wet suppression and limiting excavation during windy days should be applied.

Loss of Historical and Cultural Sites

Aspect Description

There are no existing historical and cultural sites within the site or in surrounding environment.

Ecology

Aspect Description

The civil earthwork of land clearing and site preparation as well as the construction of services and routes will disturb the entire ecosystem when removing the flora. The construction of the project of this magnitude will disturb the soil cover and vehicular movements will create dust, noise and various types of pollution levels that will cause mortality and or migration of the available fauna within the entire surrounding. However, limited loss of some terrestrial wildlife habitat and flora is expected.

Mitigations

The preservation of existing trees, as much as possible, will ensure aesthetic compatibility with the surrounding environment. Infrastructure should not be constructed within the drainage areas, and vehicular movement and access during construction should be restricted to the designated areas. A biodiversity enhancement programme (parks, open spaces etc.) should be considered after construction for areas within the settlement.

Erosion of the Top-Soil

Aspect Description

The nature of the project demands the use of heavy machinery during construction mainly for earth moving and leveling. This may lead to instability of the soil in the area and as a result cause soil erosion. Consequently this may lead gully formation if not controlled.

Mitigation

Machinery movement and equipment should be restricted to designated areas. Also construct sediment traps.

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ANNEXURE 1

BIOPHYSICAL ENVIRONMENT

1. Flora

In the central highlands the vegetation is classified as highland savannah and comprises a number of Acacia species and numerous species of perennial thorn trees in the valleys and shrubs and grass on steep slopes (Lawrence, 1971). According to Giess (1971), this area is classified as Highland Savanna vegetation type. This vegetation type is mainly characterised by trees such as *Combretum apiculatum* and Acacia species (such as *Acacia reficiens*, *A. hereroensis*, and *A. erubescens*). The grass in this vegetation type mainly comprises of the climax grasses such as *Anthephora pubescens*, *Brachiaria nigropedata*, *Digitaria eriantha* and many other species.

The following table indicates the trees and shrubs known and/or expected to occur in the project area. Their protection status is indicated (As listed in the Forestry Act).

Table 1. : **Common plant species expected to occur in the study area**

Species	Common name	Status
<i>Acacia erioloba</i>	Camel thorn	Protected
<i>Acacia mellifera</i>	Black thorn	
<i>Acacia reficiens</i>	False umbrella thorn	
<i>Acacia haematoxylon</i>	Grey camel thorn	Protected
<i>Acacia erubescens</i>	Blue thorn	

Species	Common name	Status
<i>Acacia karroo</i>	Sweet thorn	
<i>Acacia tortolis</i>	Umbrella thorn	
<i>Acacia hereroensis</i>	False hook-thorn	
<i>Commiphora tenuipetiolata</i>	White-stem corkwood	
<i>Aloe littoralis</i>		(Protected: nature conservation ordinance)
<i>Ozoroa crassinervia</i>	Namibian resin tree	Near endemic, protected
<i>Boscia albitrunca</i>	Shepherd's tree	Protected
<i>Albizia anthelmintica</i>	Worm-bark false-thorn	Protected
<i>Ziziphus mucronata</i>	Buffalo-thorn	Protected
<i>Catophractes alexandri</i>	Trumpet thorn	
<i>Combretum apiculatum</i>	Red bush willow	
<i>Commiphora dinteri</i>		Endemic
<i>Commiphora glandulosa</i>	Tall common corkwood	
<i>Commiphora glaucescens</i>	Blue-leaved corkwood	Near-endemic
<i>Croton gratissimus</i>	Lavender fever-berry	
<i>Cyphostemma bainesii</i>		Endemic, protected
<i>Dichrostachys cinerea</i>	Sickle bush	
<i>Diospyros lycioides</i>	Blue bush	
<i>Dombeya rotundifolia</i>	Common wild pear	Endemic
<i>Ehretia alba</i>		
<i>Elephantorrhiza suffruticosa</i>		

Species	Common name	Status
<i>Euclea pseudebenus</i>	Ebony tree	Protected
<i>Euclea undulate</i>	Common guarri	
<i>Euphorbia guerichiana</i>	Western woody milkbush	
<i>Euphorbia virosa</i>		
<i>Ficus cordata</i>	Namaqua fig	Protected
<i>Ficus ilicina</i>	Laurel fig	
<i>Ficus sycomorus</i>	Common cluster fig	Protected
<i>Grewia bicolor</i>	White raisin	
<i>Grewia flava</i>	Velvet raisin	
<i>Grewia flavescens</i>	Sand paper raisin	
<i>Gymnosporia senegalensis</i>	Red spike-thorn	
<i>Ipomoea adenioides</i>		
<i>Lycium bosciifolium</i>		
<i>Lycium cinereum</i>		
<i>Lycium eenii</i>		
<i>Lycium hirsutum</i>		
<i>Lycium villosum</i>		
<i>Maerua juncea</i>		
<i>Maerua schinzii</i>	Ringwood tree	Protected
<i>Manuleopsis dinteri</i>		Endemic
<i>Melianthus comosus</i>		
<i>Obetia carruthersiana</i>		Near endemic
<i>Pechuel-Loeschea Leubnitziae</i>		

Species	Common name	Status
<i>Sterculia Africana</i>	African star-chestnut	Protected
<i>Tarchonanthus Camphoratus</i>		
<i>Tetragonia schenckii</i>		
<i>Vernonia cinerascens</i>		
<i>Searsia (Rhus) ciliata</i>		
<i>Searsia (Rhus) lancea</i>	Karree	Protected
<i>Searsia (Rhus) marlothii</i>		

The following are the protected tree and shrub species listed in the Forestry Act known and/or expected to occur in the general area of the Northern Informal Settlements.

- *Albizia anthelmintica* (Worm-bark false-thorn)
- *Acacia haematoxylon* (Grey camel thorn)
- *Euclea pseudebenus* (Ebony tree)
- *Maerua schinzii* (Ringwood tree)
- *Sterculia Africana* (African star-chestnut)
- *Ficus cordata* (Namaqua fig)
- *Ficus sycomorus* (Common cluster fig)
- *Boscia albitrunca* (Shepherd's tree)
- *Ozoroa crassinervia* (Namibian resin tree)
- *Searsia (Rhus) lancea* (Karree)
- *Ziziphus mucronata* (Buffalo-thorn)
- *Acacia erioloba* (Camel thorn)

About a 100 grass species are expected to occur in the area. The species of conservation importance include: endemic (*Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finite*).

2. Fauna

2.1 Mammals

There is at least 250 species of mammals in Namibia. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. The most common endemic mammals include the rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*.

The following table indicates mammal species were known and/or are expected to occur in the general area surrounding the project area.

Table 2. Known and expected mammal species in Northern Informal Settlement

Scientific name	Common name
<i>Atelerix frontalis angolae</i>	Southern African Hedgehog
<i>Manis temminckii</i>	Ground Pangolin
<i>Proteles cristatus</i>	Aardwolf
<i>Lepus capensis</i>	Cape Hare Secure
<i>Lepus saxatilis</i>	Scrub Hare
<i>Parahyaena (Hyaena) brunnea</i>	Brown Hyena
<i>Crocuta crocuta</i>	Spotted Hyena
<i>Acinonyx jubatus</i>	Cheetah
<i>Panthera pardus</i>	Leopard
<i>Caracal caracal</i>	Caracal
<i>Felis silvestris/lybica</i>	African Wild Cat

Scientific name	Common name
<i>Felis nigripes</i>	Black-footed Cat
<i>Genetta genetta</i>	Small Spotted Genet
<i>Suricata suricatta marjoriae</i>	Suricate
<i>Cynictis penicillata</i>	Yellow Mongoose
<i>Galerella sanguinea</i>	Slender Mongoose
<i>Otocyon megalotis</i>	Bat-eared Fox
<i>Vulpes chama</i>	Cape Fox
<i>Canis mesomelas</i>	Black-backed Jackal
<i>Mellivora capensis</i>	Honey Badger/Ratel
<i>Ictonyx striatus</i>	Striped Polecat
<i>Equus zebra hartmannae</i>	Hartmann's Mountain Zebra
<i>Phacochoerus africanus</i>	Common Warthog
<i>Tragelaphus strepsiceros</i>	Greater Kudu
<i>Alcelaphus buselaphus</i>	Red Hartebeest
<i>Oryx gazella</i>	Gemsbok
<i>Sylvicapra grimmia</i>	Common Duiker
<i>Antidorcas marsupialis</i>	Springbok
<i>Raphicerus campestris</i>	Steenbok
<i>Oreotragus oreotragus</i>	Klipspringer

2.2 Birds

Namibia has about 658 species of birds (Barnard, 1998). High diversity of bird species in the study area is expected to occur in river courses. The highland savanna in which the study area is, have relatively high diversity of birds. This is probably because of the fact that the highland savanna vegetation type is at the interface of the Kalahari to the east, Karoo to the south, thorn bush savanna to the north and

escarpment to the west. Birds from all these biomes and vegetation types occur around the highland savanna. More than 230 species of birds are expected to occur in the study area (Barnard, 1998).

Bird species of conservation importance expected to occur in the area include the following species which are endemic to Namibia:

- *Pternistis hartlaubi* (Hartlaub's Spurfowl)
- *Tockus monteiri* (Monteiro's Hornbill)
- *Tockus damarensis* (Damara Hornbil)
- *Phoeniculus damarensis* (Violet Wood-Hoopoe)
- *Poicephalus rueppellii* (Rüppell's Parrot)
- *Agapornis roseicollis* (Rosy-faced Lovebird)
- *Eupodotis rueppellii* (Rüppell's Korhaan)
- *Lanioturdus torquatus* (White-tailed Shrike)
- *Parus carpi* (Carp's Tit)
- *Achaetps pycnopygius* (Rockrunner)

2.3 Amphibians

According to Griffin (1998) only anuran amphibians (frogs and toads) are found in Namibia. Namibia has about 50 frog species on record. The dependence of frogs to surface water for breeding limits most species of frog in Namibia to the five perennial rivers and more reliable seasonal sources. Despite this many species in Namibia are arid-adapted and occur throughout the country. About 9-12 species of frogs is expected to occur in the study area (Griffin, 1998).

Amphibian species expected to occur in this area include the following species of conservation importance:

- *Poyntonophrynus (Bufo) hoeschi* Hoesch's (Pygmy Toad) –Endemic

- *Phrynomantis annectens* (Marbled Rubber Frog)- Endemic
- *Pyxicephalus adspersus* (Giant Bullfrog)- Near threatened

3.4 Reptiles

There are about 261 species (56% of the Southern African region's species diversity) of reptile expected to occur in Namibia (Barnard, 1998). 71-80 species of reptiles are expected to occur in the project area (Barnard, 1998).

ANNEXURE 2

SOCIO-ECONOMIC STUDY

1. Introduction

Windhoek is experiencing the highest rural-urban migration rate in Namibia. The harsh reality is that the population in informal settlements has grown from 28,000 to 48,183 amounting to 9.46% growth in the informal settlements since Namibia's independence in 1990 until the year 2001 (CoW 2005).



Picture 1. A lady on her way to fill up 25 litre containers with water from a communal water standpipe in informal settlement.

2 Terms of Reference

The socio-economic implications of the proposed projects in northern informal settlements of the CoW have been assessed by George Eiseb, an independent social science consultant.

The following tasks formed the basis of the Terms of Reference and have been addressed in the study:

- *Establish broad baselines of the receiving socio-economic environments;*
- *Assess the identified impacts;*
- *Address negative impacts; and*
- *Liaise with the other EIA specialists so as to supplement the socio-economic study with information from their areas of expertise and to ensure integration of socio-economic issues into this EIA Report.*

3. Key Findings and Recommendations

The key findings of the social impact assessment were:

- The assessment has found that the urgency for the services in the informal areas has translated into swift project implementation that in turn has caused the public participation process to be neglected.
- The community consultation process has revealed that the quality of the some of the equipment installed during the project had social acceptability shortcomings and that some equipment used are not of a desired required standard as elaborated **section 10** of this report.
- The assessment has found that the need and the demand for basic services in these areas are beyond what the CoW could provide under the present project.

The key recommendations of the social impact assessment are:

- The CoW should not view community participation as only part of the requirement for environmental assessments (EA), but as an integral part of community development. The lessons we can learn from the present service provision project points to the need of embracing a **'sustained community participation model'** that could help inculcate not only community ownership aspect or requirement but also aid the long term sustainability of the CoW service provision programmes.
- The assessment team investigated the present conditions in the informal areas of Agste Laan and the Negende Laan areas, although that was outside the present Terms of Reference, has discovered that the lessons learnt and

the methodology that are being applied has relevance to the above areas. The approach in the above areas could focus clearly on the strengthening of '**local settlement management committees**' to strengthen community participation and responsibility regarding the future planning processes. The basic assessment of the team was that the future provision of services in these areas needs a proper environmental assessment (EA) and an social assessment on the scale of the current intervention to effectively direct the provision of future services.

- City of Windhoek management should periodically inspect the sewer servitudes to ensure that the servitude is being properly maintained by the maintenance team. Property owners should receive adequate notification of routine maintenance. Care should be taken by maintenance teams not to damage private infrastructure, and access should be restricted to roads agreed to by property owners.
- The CoW divisions has a clear recognition of the value and importance of the present Project and the future potential and significance of Public Private Partnerships (PPP's) as a future sustainable urban development model. A CoW division has requested the assessment team that the success of this project is the premise of future public discourses and engagement that could culminate in a (Dedicated Stakeholder Workshop on developing Funding Formulas based on PPP principles) aimed at bringing on board multilateral stakeholders / development partners.

4. Conclusion

The solutions require an integrated development strategy on the part of the CoW, to successfully facilitate development for the different needs in the long-term.

ANNEXURE 3

HYDROGEOLOGICAL STUDY

1. INTRODUCTION

Namib Hydrosearch was assigned to carry out a hydrogeological assessment of the northern informal settlement areas (figure 1) to investigate the potential impacts of the proposed development on groundwater resources. The investigation involved the following activities:

- *Collate all hydrogeological data with limited fieldwork and carry out a GIS based assessment of the area.*
- *Classify the area according to the sensitivity of the hydrogeological environment and conduct an initial evaluation of the engineering designs on this basis.*
- *Based on the hydrogeological data, engineering designs and concerns raised by I&APs in various public participation meetings identify the potential impacts.*
- *Document the findings and the make recommendations to mitigate against possible negative impacts.*
- *Liaise with other specialist in identifying common issues and mitigation.*

2. GROUNDWATER RESOURCE

Kuiseb Formation (Swakop Group) rocks forms the bedrock geology of the area (**Figure 3**). The dominant lithologies are biotite schist and quartz biotite schist. Surficial deposits are generally thin to very thin over much of the area. Along the larger drainages, some alluvial deposits (about 1 m) have developed.

Structures present are north-south and northwest-southeast faults and joint systems (**Figure 3**). To the south of the City, north-south normal faulting of the brittle Auas Formation quartzite is responsible for the development of the high yielding Windhoek aquifer. The north-south fault systems extend to this area and affect the Kuiseb Formation rocks. These faults are less developed in the micaceous lithologies as the mica schist undergoes plastic deformation. The

major faults are shown in published geology maps and are often marked by north flowing ephemeral streams.

2.1 Hydrogeological Conditions

In the area borehole information is scarce and only four (4) partial borehole records were located. From adjacent areas it is known that the fractured Kuiseb Formation mica schists form low potential aquifers often with poor quality water. Yielding boreholes appear to be associated with the north-south structures and drainage channels. The fractured mica schist do not form aquifers of the same potential as in the fractured quartzite Windhoek aquifer to the south and the area is classified as having low potential in the Hydrogeological Map of Namibia. In general, groundwater (and surface water) flow is northwards.

The study area has undulating terrain with elevation differences of 20-30m being common (**Figure 2**). The depth to water table is thus variable from being deep in elevated areas to shallower in the larger valleys.

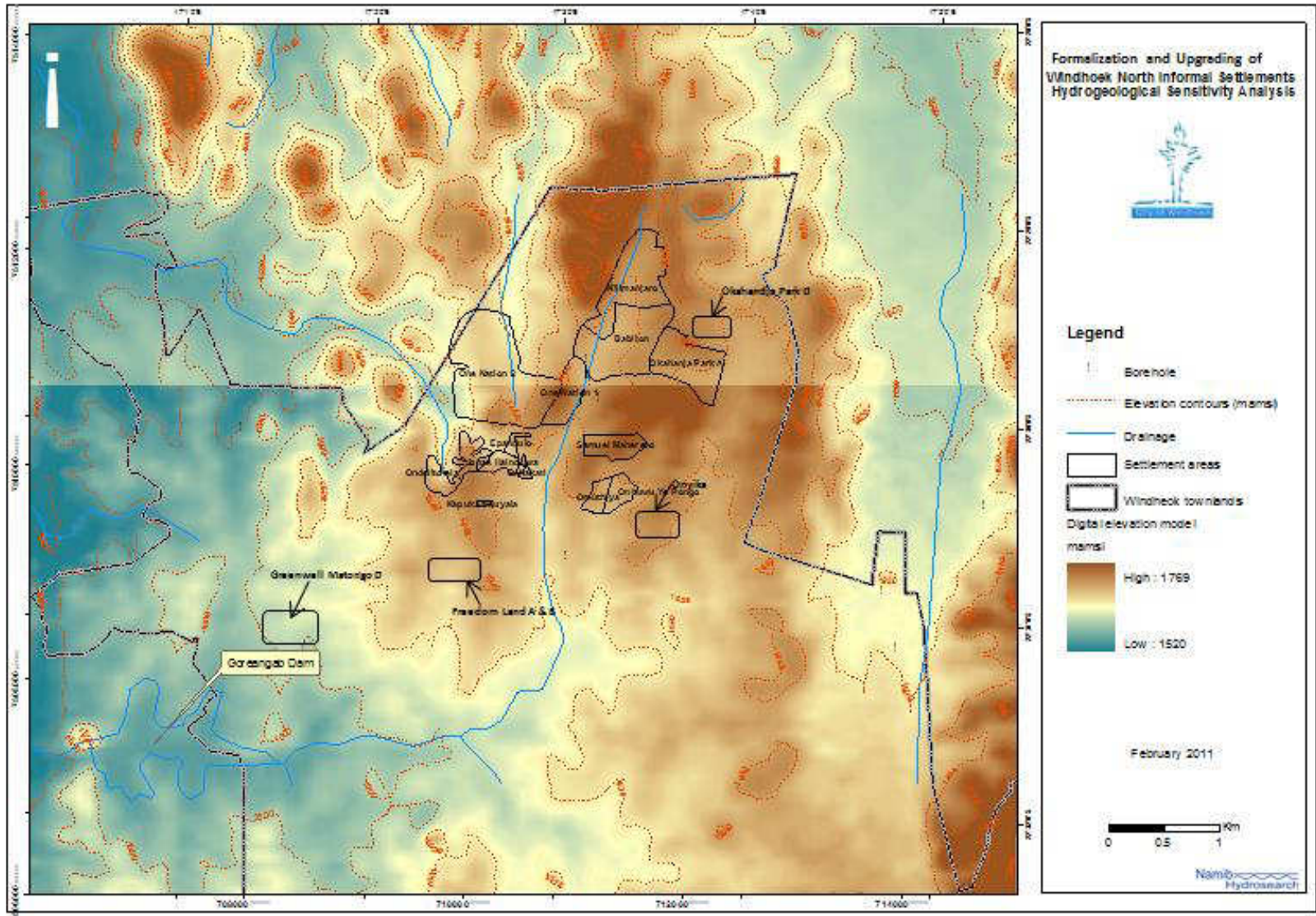


Figure 1: Study area shown on digital elevation data. Major drainages and Goreangab Dam shown in relation to the project areas

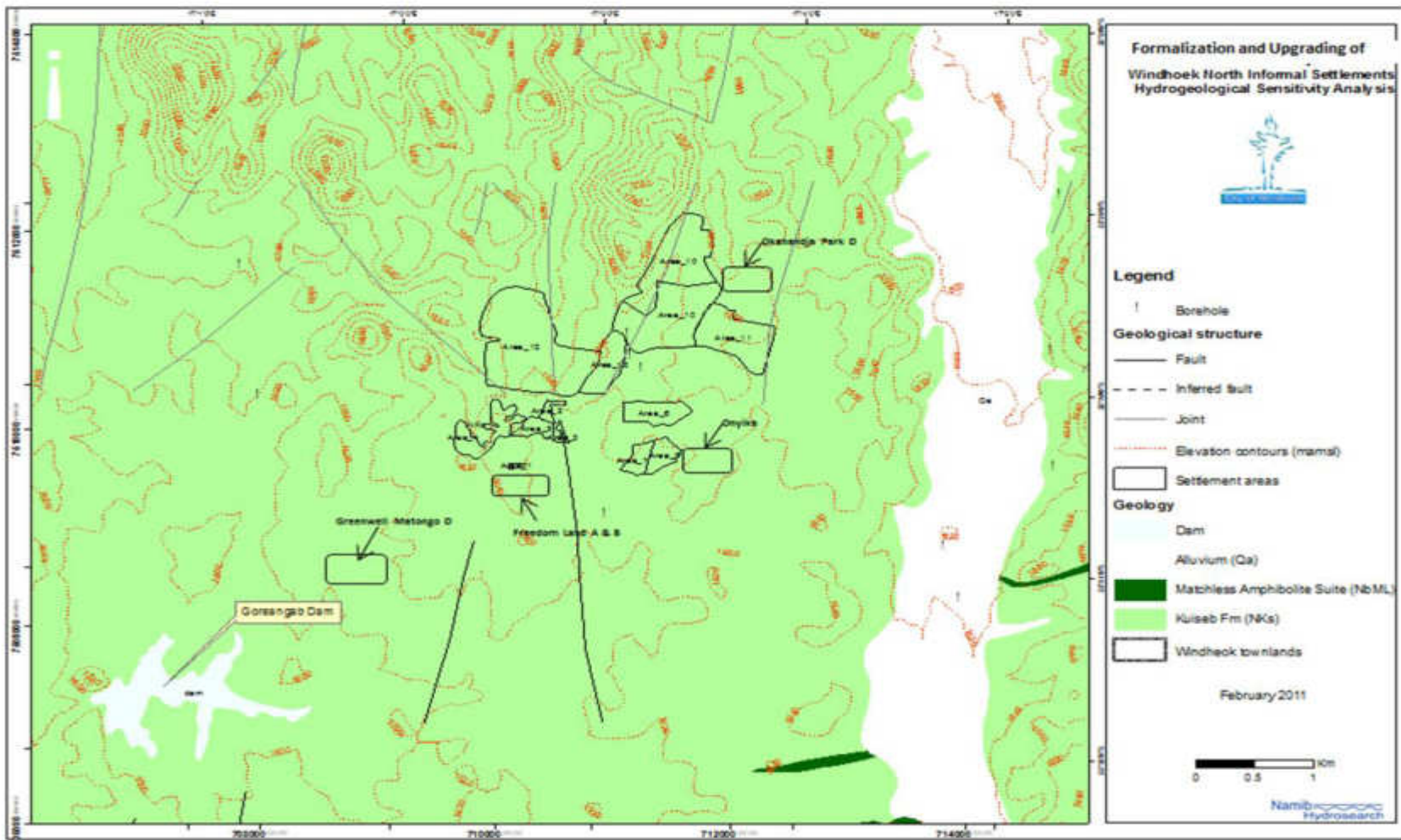


Figure 2: Study area shown on digital elevation data: Major drainages and Goreangab Dam shown in relation to the project areas.

2.2 Recharge

Comments on recharge to the underground water resources in the Windhoek area is summarised in Barbour (1997) and is reproduced here verbatim:

- *Direct and indirect recharge from rainfall. Precipitation and run-off over quartzite outcrop areas can reach the water table by infiltrating fractures, joints or bedding planes or via any large outcropping fault zone in the vicinity. Other recharge routes are via fault zones, which cut the surface in schist outcrop areas. Stream courses frequently follow the outcrop of fault zones, thereby promoting indirect recharge from runoff along streams.*
- *From lateral sub-surface inflow along the quartzite beds from higher-lying areas to the east and southwest of the wellfield area.*
- *From deep-seated underlying sources via the major faults that cut the area. This is the source of the hot water found in certain of the production boreholes.*

Barbour (1997) further comments on the pollution threat as follows:

When assessing the pollution threat to the underground water resources posed by development on surface, the danger is as a result of the production of contaminating waste substances on surface which can be mobilised by water from rainfall or from any other source, and reach the water-table by means of the mechanisms described in paragraph 1 above.”

2.3 Topography and Drainage

The informal settlement area is located in an elevated area with south and north flowing ephemeral streams draining the area (**Figure 2**). The north flowing streams in the central part of the study area flow into the Aretaragas River. The south flowing streams merge and flow in the Goreangab Dam to the south west of the area. In the absence of any sanitation facilities in the informal areas, it is conjectured that the effluent from the area currently enters the drainage system and is removed downstream by surface flow.

2.5 Specific Methodology

The risk of groundwater contamination from pollution sources at surface is determined by the possibility of movement through the land surface (infiltration) into the unsaturated zone and the ability to travel through the unsaturated zone to the saturated zone (aquifer). The programme of investigation has therefore focused on the interpretation of the geology and structure and included the following tasks:

- Detailed air-photo interpretation to identify geological structure and areas of soil cover
- Understanding of the geology of the area from published maps and field visit
- Evaluation and interpretation of data
- Mapping of zones of high pollution vulnerability

A search for all relevant data regarding geology and hydrogeology as well as existing reports was carried out. Data and information was obtained from various sources such as the CoW, the Geological Survey of Namibia, and the Department Water Affairs.

Previous Studies

Several reports of previous studies have been located and findings from two relevant studies from neighbouring areas are summarised below.

Geotechnical Implications of Dry Sanitation, Interconsult, 1999; CoW

Soil tests

Test pits excavated showed that the soil is generally less than 1m thick. More commonly the bedrock outcrops, which may be covered by a very thin veneer of quartz float and regolith. Where surface drainage courses (ephemeral streams) have incised steep sided valleys a thin layer of scree may occur on the lower slopes. Immature alluvium forms the bed of these streams.

Infiltration Tests: Infiltration coefficient (Kp) values ranging from 50-250 l/h were obtained.

Sorption Studies: Qualitative cation and anion sorption studies were carried out. Sorbent qualities of the tested soil samples with respect to organic molecules as very poor. Therefore one cannot rely on the soil to restrict seepage from effluent.

Identification of areas for ultra low-income settlement: Effect on underground water resources. Carr Barbour and Associates, 1997; City of Windhoek

Barbour, 1997 provides an overview of the pollution potential of 8 settlements to be serviced by dry sanitation systems. It was concluded that, under the prevailing groundwater conditions in the area studied, there was little likelihood of pollution resulting from the use of the systems. This was due to the following:

- the water table is approximately 50m below surface
- hydraulic conductivity in the schistose lithologies characterising the area is generally very low, particularly below the weathered zone near surface and away from fractures.
- clogging will reduce vertical hydraulic conductivity over time,
- passage through the dry unsaturated zone will improve effluent quality through the die off of organisms,
- the expected volume of discharge from each system is small,
- It was recommended that the City Council use the systems but with certain provisos such as:
 - attention be given to improved pit design
 - foreign discharge (from sources other than the digestion tank) is to be avoided
 - pits should avoid natural drainage in the area
 - monitoring boreholes should be sunk at appropriate sites and a monitoring programme initiated.

GIS based deskstudy

Basemaps were produced for interpretation and fieldwork. The aerial photo mosaic proved the most useful data set for interpretation of the geology, structure and drainage. Unfortunately the natural characteristics of the builtup areas are lost to a large extent in the images. The digital elevation model and older images were used to retrieve some information from these areas. The data density in these areas however remains low. The following data sets were used in the study:

- structural interpretation of the underlying geology was conducted using high-resolution digital aerial photo mosaic
- use of the SRTM digital elevation model to capture data on slopes and drainage
- capture of drainage lines from the aerial photo mosaic
- overlay of digital geological data (1:250,000)
- overlay of informal settlement areas.

Fieldwork

Fieldwork was carried out to ground truth interpretation based on GIS. The main observations are given:

- The position of north-south fault system and lineaments were verified and visited digitised lineaments were found to be correctly located (**Figure 4** and **Figure 5**). The north-south faults form linear valleys often with ephemeral streams.
- Soil cover in the area is minimal with sub-cropping mica schist visible in most areas. It was estimated that most areas have less than one meter of soil cover. Soil and scree cover is thicker in the base of the north-south valleys marking the location of faults.
- The informal settlements are located in elevated areas and in gentler slopes. The bottom of the valley and steeper slopes are largely uninhabited.
- No sewer system is present in the area, and the limit of CoW services areas lie immediately to the south. The waste from this area, including human waste, finds its way into the surface drainage.
- No boreholes were found in the areas probably due to the limited yield in mica schist.

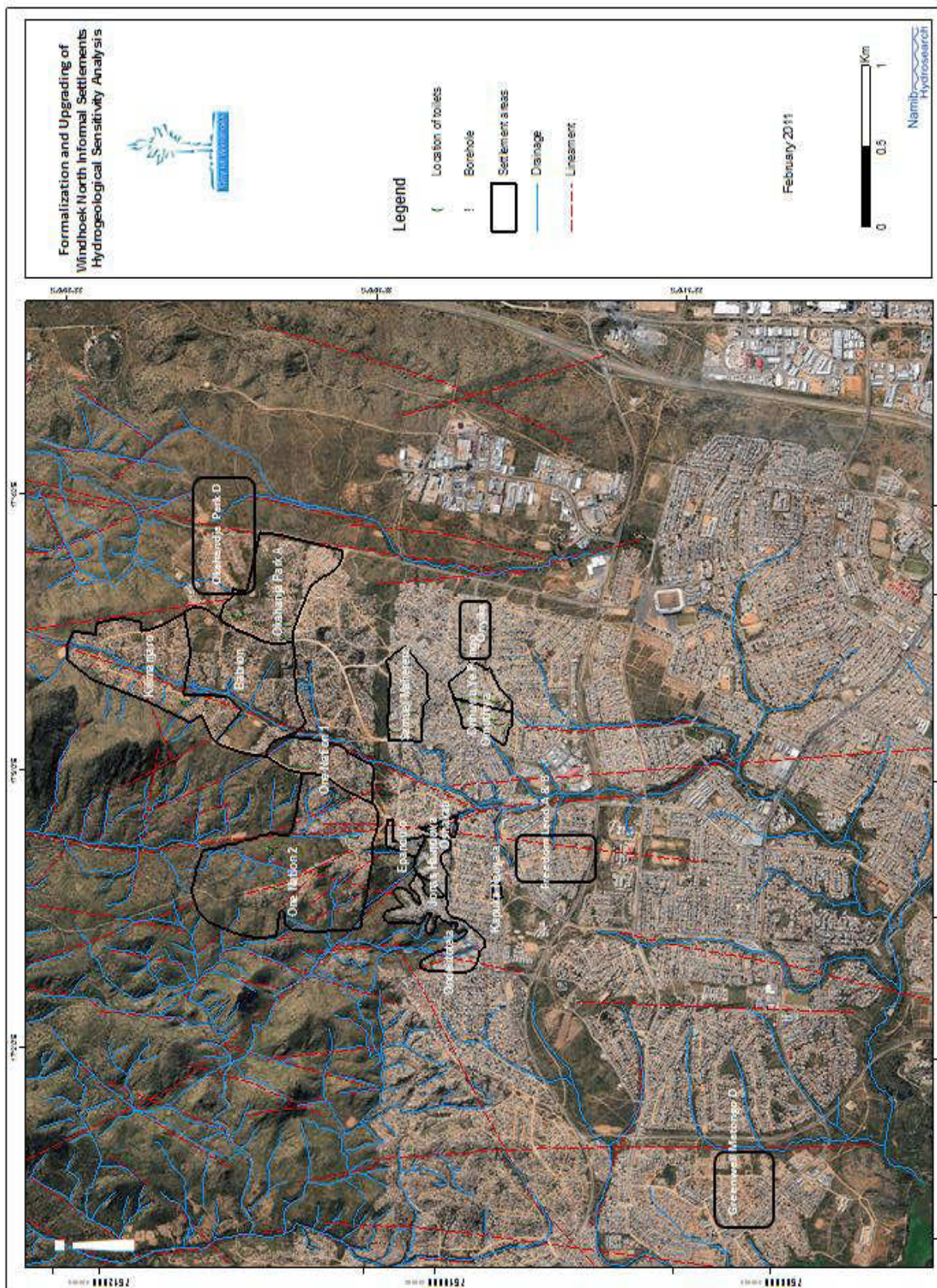


Figure 3 : Aerial photo mosaic of the study area with digitised lineaments and drainages. Note that details are obscured in the built up areas.

3 Key Findings

Zones of susceptibility to pollution have been identified from the above. The basis for the zonation of the area was decided using the following parameters as discussed above:

- lithology of the underlying bedrock
- proximity to faults and fractures
- thickness and nature of overburden and its sorption properties
- slope and surface drainage

Of these the positions of fault zones (lineaments) and drainage were given the highest priority. The underlying lithology consisting of quartz-biotite schist has relatively low infiltration capacity and is not necessarily capable of high groundwater yields but where dissected by faults and numerous fractures form conduits for groundwater recharge. The groundwater resource is not presently used in the area, it is tapped further to the north by numerous smallholders and farmers, and surface drainage flows into the Aretaragas River or Goreangab Dam (which is to large extent already polluted). The soil, examined in a nearby area, is known to have low capacity to retard organic pollutants.

As such, effluent infiltrating from surface will pose a threat to users to the north or surface water bodies and effort should be made to prevent pollution and not further deteriorate the current condition of the surface water bodies. The drainage in the area is part of the Swakop River catchment and eventual pollution of surface water bodies such as the Swakopoort Dam is possible from this source. It should also be noted that the DWAF borehole database hasn't been regularly updated and that the number of boreholes down gradient of the area could be much higher.

In order to aid design of a safe sanitation system and sewer network the area has been classified into 3 Zones while the drainage system has been identified as vulnerable to illegal surface waste and pollutants:

- Zone 1 – where no leakage of effluent is permitted, extends 50m on either side of areas where streams and faults (lineaments) coincide and within a 20m strip on either side of lineaments (**Figure 6**).
- Zone 2 – where effluent discharge poses a lesser threat. This zone extends from the boundaries of Zone 1 to 50m away on either side from the lineaments (**Figure 7**).

- Zone 3 – areas not classified as Zone 1 or 2.
- Drainage – the drainages and immediate surroundings are classified as vulnerable to dumping of wastes, leakage from sewer systems and informal lavatories (**Figure 2**)

Zone 1 areas is expected to have higher infiltration rates, particularly in times of high precipitation and surface water flow. In these areas effluent and other pollutants should not to be allowed to be discharged. In Zone 2, the ground is characterised by less infiltration potential and possibly thicker unsaturated zone but is in almost all cases immediately up slope of the higher risk Zone 1 and therefore it is important that protection measures are adhered to. The drainages require protection as discussed above. The south flowing drainage flows into the Goreangab Dam while those draining north drain into the Aretaragas River and pose a risk to downstream fresh water resources.

The proposed sewer network and sanitary systems should be implemented as a matter of priority to avoid pollution of surface water and groundwater resources in the area and downstream of the area.



Figure 5: North – south lineament evident as valley with ephemeral stream

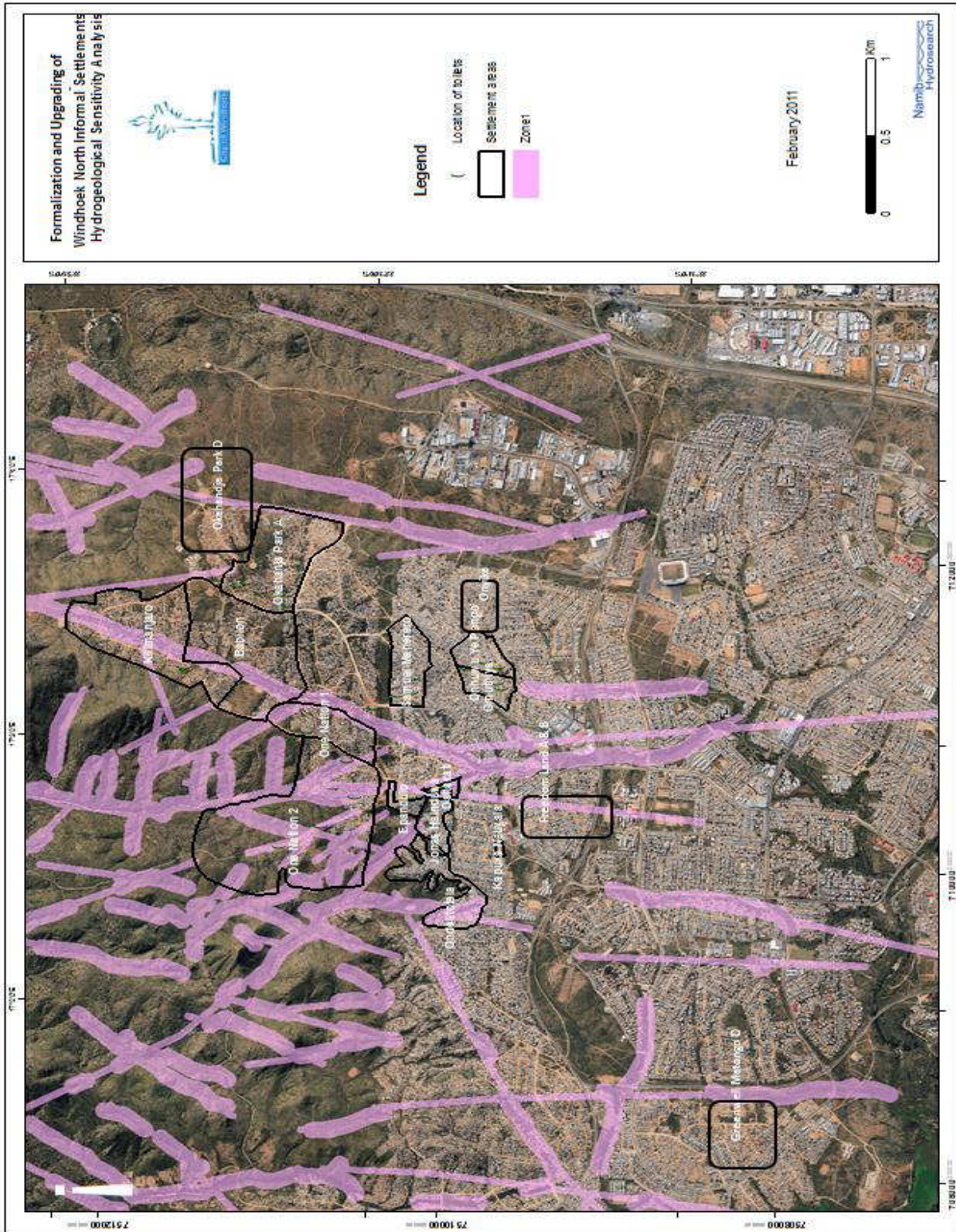


Figure 6: Zone 1 area: no leakage of effluent is permitted.

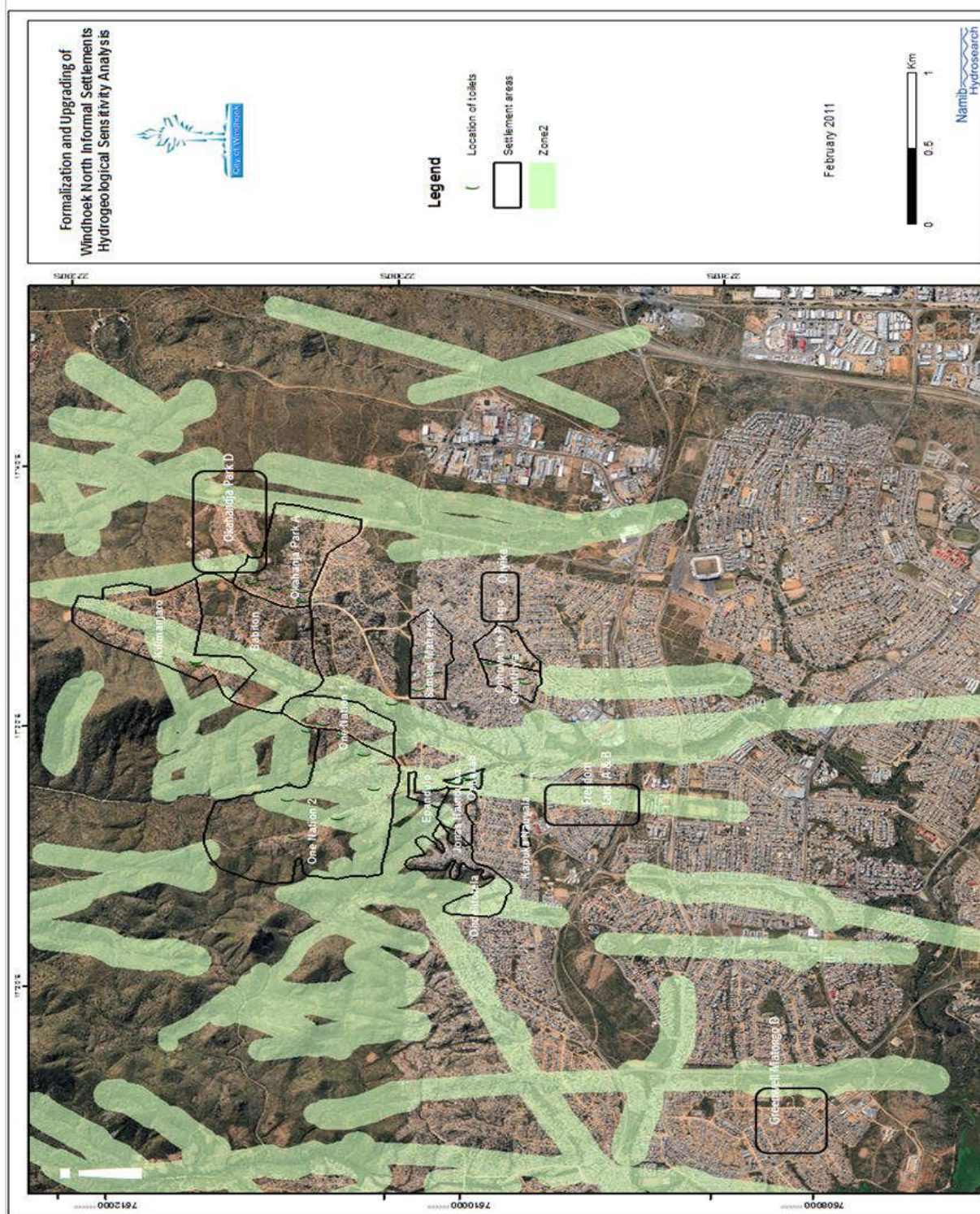


Figure 7: Zone 2 areas: where effluent discharge poses a lesser threat but areas mostly are up slope of the higher risk Zone 1

4 Conclusions

It is concluded that:

- The underlying geology consists of mica schist and in general has low infiltration potential. But, where faulted, infiltration is likely to be higher.
- The soil has low sorption capacity to retard pollutants.
- Discharge of effluent that reach geological faults and drainages can lead to groundwater pollution and certain areas are demarcated for protection - Zone 1 and 2.
- The overburden is thin and made up of weathered schist and quartz float. The thickness is generally 1m or less. Surface drainages therefore need to be free of waste and effluent.
- The proposed sewer network and sanitary systems should be implemented as a matter of priority to avoid pollution of downstream surface water.

5 Recommendations

It is recommended that:

- The protection of groundwater resources through the protection zones be implemented.
- Groundwater pollution monitoring should be included as an integral part of any proposed sanitation implementation.
- The sanitation and sewer network should be implemented as a matter of urgency to protect surface and groundwater resources.

ANNEXURE D

ENVIRONMENT IMPACT ASSESMENT

ENVIRONMENTAL MANAGEMENT PLAN
FOR SERVICE PROVISION AND TOWNSHIP ESTABLISHMENT FOR NORTHERN
INFORMAL SETTLEMENTS
OF
OMUTHIYA AND ONGHUWO YE PONGO, ONE NATION 1, ONYIKA, GREENWELL
MATANGO D, OKAHANDJA PARK D AND FREEDOM LAND A & B.
IN WINDHOEK
FEBRUARY 2014



DR. M. KATJIUA AND MR. G. EISEB

CITY OF WINDHOEK

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LIST OF ABBREVIATIONS

CoW	City of Windhoek
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
I&APs	Interested and Affected Parties
MET: DEA	Ministry of Environment and Tourism: Directorate of Environmental Affairs

1. INTRODUCTION

The City of Windhoek (**CoW**) intends to apply to NAMPAB and Township Board to upgrade, formalise and proclaim the informal settlements of Omuthiya and Onghuwo ye Pongo, One Nation 1, Onyika, Greenwell Matongo D, Okahandja Park and Freedom Land A & B. These informal settlements are situated at the outskirts in the Northern Periphery of Windhoek.

This will be done according to the “Development and Upgrading Strategy”, which focus on in-situ upgrading. This means providing services where informal houses are located, and formalising of houses later by owners.

Informal Settlements of Greenwell Matongo D, Onyika and Freedom Land A & B has already been upgraded while Omuthiya and Onghuwo Ye Pongo, One Nation 1 and Okahandja Park D still needs to be upgraded.

Some of this informal settlements in the Northern Periphery of Windhoek is currently zoned “*Undetermined*”, while others are situated on erven zoned residential, business and public open spaces and was not originally intended for residential development, but it has been inhabited or are existing informal settlements. In order to rezone the proposed areas to “general residential, institutional, business and public open space” for township proclamation, the CoW is required to undertake an Environmental Impact Assessment (**EIA**).

In terms of Section 27 of the Environmental Management Act, 2007 (Act No. 7 of 2007), the formalisation of a new township development or extensions falls under the list of activities that may not be undertaken without environmental clearance certificate. Thus, the proposed areas require an environmental clearance certificate in order finalise the formalisation process.

This Environment Management Plan (**EMP**) is developed to outline measures that need to be implemented in order to minimize adverse environmental degradation associated with the construction of water, sewerage, electricity and roads services in the informal settlement of Windhoek. It serves as a guide for the

contractor, sub-contractors and their respective workforce on their roles and responsibilities concerning environmental management on the site and it provides a framework for environmental monitoring throughout the development period.

2. Environmental Management Plan

An EMP is a site-specific plan developed to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that the environmental risks are properly managed. In actual fact, the EMP is the essential link between environmental impacts assessment and project activities. It is to ensure that environmental impacts identified during the assessment stage are properly managed on site and control measures are implemented.

2.1 Objectives

The EMP will form the basic tool for reducing the magnitude of impacts and suggesting practical measures to attain this. It is also used to measure compliance by the applicant. It is this tool that gives guidance during monitoring, auditing and taking corrective actions during its implementations, thereby ensuring continuous monitoring of the environment. An EMP is developed after an environmental assessment, depending on the level of such assessment.

The objectives of environmental plans, as outlined in PART VI of the Environmental Management Act No. 7 of 2007, are to: -

- (a) co-ordinate and harmonise the environmental policies, plans, programmes and decisions of the various organs of state that exercise functions that may affect the environment or are entrusted with powers and duties aimed at the achievement, promotion, and protection of a sustainable environment, in order to –
 - (i) Minimise the duplication of procedures and functions; and

- (ii) Promote consistency in the exercise of functions that may affect the environment; and
- (b) Enable the Minister to monitor the achievement, promotion and protection of a sustainable environment.

This EMP will help the Project Manager to map progress toward achieving continual improvements. In this way, the tabulated mitigatory measures will assist the constructor, the Ministry of Environment and Tourism (MET) and the City of Windhoek (CoW) in ensuring that impacts to the environment are minimized during the construction of bulk water, sewerage, electricity and roads services in the northern informal settlement.

Take Note: This EMP should be read with the Environment Impact Assessment Report

3. ROLES AND RESPONSIBILITIES

The EMP requires the involvement of multiple stakeholders; the Applicant (City of Windhoek), the Consulting Engineer and the Contractor. The following are the responsibilities of the different key stakeholders:

3.1 Applicant (Municipality of Windhoek)

The applicant is responsible for

- Review reports regarding the implementation of the EMP and make payments to the Contractor if the EMP is being implemented in a satisfactory manner.
- Give warnings and imposes fines and penalties on the Contractor if the Contractor neglects to implement the EMP satisfactorily.

3.2 Project Engineer

The Project Engineer (**PE**) will be appointed by the Applicant and will work close with the CoW.

The CoW should visit the project site on a regular basis to perform compliance monitoring of the contractors operations to this EMP. Any matters of non-compliance are communicated to the Contractor by the CoW.

The following are the responsibilities of the Project Engineer:

- be familiar with all aspects of the EIA Report and EMP
- Responsible for ensuring that the Contractor complies with this EMP throughout the construction phase.
- Review and approve the contractors Management Plan based on guidance provided by this EMP.
- Monitor the Contractors compliance to the EMP on a regular basis.

- Discuss EMP issues at every monthly site meeting (with input provided by the City of Windhoek Environmental Division (**CoW ED**) when he/she attends the site meeting).
- Communicate to the Contractor, verbally and in writing, regarding any matters of non-compliance.
- Ensure that land areas are properly designated according to the approved construction site layout, including sensitive environment and “No go” areas.
- Undertake damage assessments where incidents, accidents and serious infringements have occurred.
- Inspect and approve all areas that have been rehabilitated by the Contractor.
- Review complaints received and issue instructions to the Contractor as necessary.
- Maintain a record of complains from the public and communicate the complains to the Contractors.
- Enforce temporary work stoppages where serious environmental or health & safety infringes and non-compliances have occurred.

3.3 City of Windhoek Environmental Division

The following are the responsibilities of the City of Windhoek Environment Division (CoW ED):

- Be familiar with all aspects of the EMP
- Review the Contractors Management Plan and inform the Project Engineer whether the Management plan is acceptable or if it needs to be revised.
- Perform regular environmental audits to inspect the site and determine whether the contractors operations are in compliance with the EMP.
- On a monthly basis, attend site meetings with the PE and Contractor.
- Provide guidance to the PE on matters of non-compliance.

- Undertake damage assessments where incidents, accidents and serious infringements have occurred.

3.4 Contractor

The following are the responsibilities of the Contractor:

- Fully implement the conditions stipulated in the Authorisation and Record of decision issued by Environmental Commissioner/Directorate of Environmental Affairs (**DEA**) and any other competent regulatory body having authority over the project or the activities concerned.
- Read this EMP with the EIA Report, fully implement the EMP and ensure compliance throughout the project duration.
- Act as an Environmental Management Officer or appoint such Officer to oversee all aspects of the implementation of the EMP and communicate with the PE and CoW ED on all EMP related issues.
- Prepare a Management Plan that includes Sub-Plans, Method Statement and drawings as described below in this EMP.
- Prepare and submit a monthly report concerning environmental management and health and safety issues. The report contents will cover: any training performed; status of training received by all staff and sub-contractors; copies of the Contractors weekly Site inspection Forms; summary of any issues or incidents concerning environmental management or health & safety, and what the contractors has done to address the issues and incidents that have been identified by the Contractor.
- Ensure that all employees and sub-contractors on site are informed about environmental and health & safety responsibilities, practices and procedure.
- Perform daily inspections to monitor environmental management and safety & health performances.

- Perform weekly inspections for which site Inspection Forms must be completed, and submit the completed Forms to the PE on a monthly basis.
- Notify the PE immediately in the event of any accident or infringement of the EMP and ensure appropriate remedial action is taken.
- Notify the PE at least 10 working days in advance of any activity he/she has reason to believe may have significant adverse environmental impacts, so that mitigatory measures may be implemented timeously.
- Maintain a register for environmental management, health & safety and HIV/AIDS training for site staff and sub-contractors staff for the duration of the contract.
- Identification and enforcement of environmental “No Go” areas (to be approved by the PE).
- Ensure that stockpiles and construction waste is stored and disposed off according to the relevant laws, policies and guidelines.
- Undertake a rehabilitation of all areas affected by the construction activities to restore them to an acceptable state, as determined by the PE.
- Develop and conduct training and awareness sessions regarding: Environmental management practices and procedures for the project; health & safety issues, practices and procedures for the project, and; HIV/AIDS background, prevention, testing, treatment and counselling.

4. COMPLIANCE WITH ENVIRONMENT MANAGEMENT PLAN

The Contractor shall ensure that all construction staff; sub-contractors, suppliers, etc. are familiar with, understand, and adhere to this EMP. Failure by any employee or Contractor, Sub-contractors, or suppliers to comply with the EMP shall be considered sufficient cause for the PE to instruct the Contractor to have the relevant employee removed from the site. The applicant may also order the contractor to suspend part or all of the works if there is non-compliance with the EMP. Such suspension shall be lifted only when the offending procedure and requirement is corrected and/or if required remedial measures are put in place.

5. PROCEDURES REGARDING NON-COMPLIANCE

The Contractor must fully implement and comply with the EMP on an ongoing basis throughout the duration of construction activities. If and when the Contractor fails to do so, the Applicant or the PE shall follow in matters of non-compliance as described in the Contract Document between the Applicant, Project Engineer and the Contractor.

6. MITIGATION MEASURES

Specified activities that pose environmental impacts and environmental management mitigation measures to be implemented during construction are tabulated below.

Most environmental impacts of development occur in the construction phase of the project. As a result the regulation of construction activities and the general conduct of the workforce is an essential component EMP.

MITIGATION MEASURES RELATED TO SITE ACCESS IMPACT	RESPONSIBILITY
<ul style="list-style-type: none"> • Any limitations when deciding on access or alternative routes to the construction site must be taken into consideration. • Choice of access routes should take into account minimum disturbance to residence • All roads for construction access must not be created on an ad hoc basis but maintained as planned and approved ahead of construction activities. • The location of all underground services and servitudes must be recorded and adhered to as identified and confirmed before construction commenced. 	Project Engineer & Contractors
MITIGATION MEASURES RELATED TO THE ESTABLISHMENT OF THE CONTRACTORS LAY- DOWN AREA IMPACTS	RESPONSIBILITY
<ul style="list-style-type: none"> • Potable water must be available at all times at various points within the Contractors area. • Portable chemical toilets must be provided to the staff members 	Project Engineer & Contractors

<ul style="list-style-type: none"> • An adequate number of waste receptacles must be available at strategic locations for gathering all domestic refuse, and to minimize littering. • Recycling and the provision of separate waste receptacles for different types of waste must be encouraged. • A fenced off area must be allocated for waste sorting and disposal. • Potable water is to be sourced from an existing supply, and made available at various locations. • A dedicated source of water for dust suppression purposes must be determined during site establishment. 	
<p><i>MITIGATION MEASURES RELATED TO THE MAINTAINANCE OF THE CONTRACTORS LAY-DOWN AREA IMPACTS</i></p>	<p><i>RESPONIBILTY</i></p>
<ul style="list-style-type: none"> • The Contractor must monitor and manage the drainage of the site to avoid standing water and soil erosion. 	<p>Project Engineer & Contractors</p>
<ul style="list-style-type: none"> • Identification of disposal sites for the various categories of waste likely to be generated on site and must be provided with documented proof of the type and volume of waste disposal of at these sites. 	<p>Project Engineer & Contractors</p>
<ul style="list-style-type: none"> • The general cleanliness of the site and compliance with the CoW waste disposal requirements will form part of the site inspections. 	<p>Project Engineer & Contractors</p>

<ul style="list-style-type: none"> • Where possible, waste must be collected for recycling programmes provided that the original contents of the containers were not hazardous. • Scrap metal (components, sheet metal, nails and tins) must be stored in a designated scrap metal container (e.g. a skip). • When the scrap metal container is full, the scrap metal must either be collected by a scrap metal dealer or transferred to an appropriate disposal site. • Hazardous substance containers, contaminated substrates and materials used in the clean-up of spillages must be stored in a designated, impermeable container (e.g. a skip). • The hazardous substance containers, contaminated soil, clean-up materials, etc. must be transferred to an appropriate disposal site on a regular basis. • An adequate number of self-contained chemical toilets must be established in case. Contractors must supply toilet paper at all toilets, and will be responsible for their maintenance and servicing. • The temporary ablution facilities, if any, must conform to the requirements stipulated by the Department of Health of the CoW. • In case, toilets must be placed outside areas susceptible to standing or flowing water. • The ablution facilities must be maintained in a clean and orderly state and are to be regularly cleared to prevent odour and pest problems. 	
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<ul style="list-style-type: none"> • A contingency plan for spills from toilets must be in place. • Contractors must ensure that no spillage occurs when chemical toilets are used, cleaned and cleared and that the contents is carefully stored and transported when removing off-site. All spills must be recorded in the incident management system. 	
<p>MITIGATION MEASURES RELATED TO CONSTRUCTION ACTIVITIES IMPACTS</p>	<p>RESPONSIBILTIES</p>
<ul style="list-style-type: none"> • If small volumes of concrete are to be mixed (manually), mixing is to be undertaken on a hard surface covered in plastic sheeting so that concrete waste and runoff can be contained. • All concrete waste is to be collected, recycled if possible, and removed from the site for disposal at an appropriate disposal site. • On completion of construction, all leftover construction materials are to be removed from the working area. • The materials must be disposed of at an appropriate site, sold / donated. • Materials should be prepared and stored away from watercourses. • Implement measures to prevent seepage of liquid materials into ground where it could contaminate groundwater. • Ensure prompt cleaning up of accidental spillages. 	<p>Project Engineer & Contractors</p>

<ul style="list-style-type: none"> • Ensure that the machinery / equipment are maintained in a good operating condition to prevent the contamination of hydrological features by diesel, grease, oil, etc. derived from the working area. • Create specially designated areas for vehicle maintenance. • Cleaned up accidental spillages promptly. 	
<p>MITIGATION MEASURES RELATED TO STORAGE FACILITIES IMPACTS</p>	<p>RESPONSIBILITY</p>
<ul style="list-style-type: none"> • Choice of location for storage areas must take into account prevailing winds, distance from water bodies and general on-site topography. • Storage areas must be designated, demarcated and adequately fenced if necessary. • All fuel required on site is to be stored within an adequately sized bund wall that has an impermeable base. The capacity of the bund wall is adequate to cope with a spill / leak of the fuel storage container. • A designated working area must be made available and must be underlain by an impermeable surface (e.g. a concrete slab or plastic lining). • All handling of potentially toxic or hazardous material, and the repair, maintenance and storage of vehicles and equipment must be undertaken on the impermeable working surface in accordance with the Materials Safety Data Sheets (MSDS). 	<p>Project Engineer & Contractors</p>

<ul style="list-style-type: none"> • Fire prevention facilities must be present and easily accessible at all storage facilities. 	
<p>MITIGATION MEASURES RELATED TO SAFETY</p>	<p>RESPONSIBILITY</p>
<ul style="list-style-type: none"> • Material stockpiles must be stable and well secured to avoid collapse and possible injury to workers / local residents. • Flammable materials should be stored as far as possible from any sensitive receptors. • Fire-fighting equipment is to be present on site at all times. • No materials are to be stored in unsuitable or high-risk areas. • All trenches should be demarcated. 	<p>Project Engineer & Contractors</p>
<ul style="list-style-type: none"> • Material Safety Data Sheets (MSDS's) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available MSDS's should include additional information on ecological impacts and measures to minimize and mitigate against any negative environmental impacts in the result of an accidental spill. • Hazardous storage and refueling areas must be bunded with an impermeable liner to protect groundwater quality. • Storage areas containing hazardous substances / materials must be clearly signed. • Staff handling hazardous substances / materials must be aware of their potential impacts and follow appropriate safety measures. 	<p>Project Engineer & Contractors, MET & CoW: ED</p>

MITIGATION MEASURES RELATED TO THE EDUCATION OF SITE STAFF ON GENERAL AND ENVIRONMENTAL CONDUCT	RESPONSIBILITY
<ul style="list-style-type: none"> • Ensure that all site personnel have a basic level of environmental awareness training. • Translators are to be used if necessary. • No alcohol / drugs to be allowed on site and driving under the influence of alcohol is prohibited. • No firearms allowed on site or in vehicles transporting staff to / from the site (unless used by security personnel). • Prevent excessive noise. • Construction staff is to make use of the facilities provided for them, as opposed to ad hoc alternatives. • Trespassing on private / commercial properties adjoining the site is forbidden. 	Project Engineer & Contractors, MET & CoW: ED
MITIGATION MEASURES RELATED TO POLLUTION MANAGEMENT AND CONTROL IMPACTS	RESPONSIBILITY
<ul style="list-style-type: none"> • Excavation, handling and transport of materials must be avoided under high wind conditions or when a visible dust plume is present. • During high wind conditions, dust suppression measures will be required. • Soils stockpiles are to be located in sheltered areas where they will not be exposed to the erosive effects of the wind. 	Project Engineer & Contractors

<ul style="list-style-type: none">• Appropriate dust suppression measures must be used when dust generation is unavoidable (dampening with water).• Disturbance of the residents in the vicinity of the construction areas will have to be taken into account during the construction period.• The sitting of areas for delivery of equipment and materials must take into account the noise generated by the vehicle as well as noise generated by off-loading equipment.• Jackhammers and their associated compressors exhibit continuous noise that could impact on nearby residents. Acoustic treatment of the jackhammers must include silencers on the exhausts.• Concrete mixers must be sited to minimize the impact on nearby residents.• All vehicles and equipment must be properly maintained to reduce unnecessary noise.• Factors to take into account are; arriving and departing traffic, loading and unloading of equipment and materials; and day-to-day operations.• All soil that is contaminated must be removed and stored in a skip until it can be disposed of at an appropriate disposal site.• All wastewater and polluted runoff from contaminated areas must be channelled into appropriately sized, designed and located collection sump.	
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<ul style="list-style-type: none"> • All equipment that may leak on an impermeable surface should be stored with watertight drip trays to catch any pollutants. • The drip trays must be cleaned regularly, and must not be allowed to overflow. • Chemicals collected in the drip trays must be collected and disposed of in an appropriate manner (MSDS). 	
<ul style="list-style-type: none"> • All wastewater and contaminated runoff from the storage and working areas of the site must be channelled into existing wastewater management system. • Contaminated liquids and sediments from the wastewater management system must be disposed of at an appropriate permitted disposal site. • All liquid fuels (e.g. diesel and petrol) which are stored in tanks or drums must have a bund wall around the tanks to prevent liquids from escaping in the event of a spill or leak. • The volume of the bund must be 110% of the volume of the storage tanks. • Any person delivering fuels or other chemicals to the site must be aware of the appropriate storage / drop-off locations and the environmental controls that apply. • The handling and storage of hazardous materials must be in accordance with the MSDS and must be restricted to designated areas. If additional areas / sites are required for the storage or 	<p>Project & Service Contractors, MET & CoW Safety, Health, Environment and Quality Officers</p>

handling of hazardous substances, they must be assessed.

- An inventory of all fuels and hazardous substances to be used and stored on the site, and must ensure that they know the effects of these substances on their staff and the environment.
- Quantities of fuels and chemicals stored on site must be appropriately stored and handled so as to minimize the risk of spills.
- All fuels and chemicals must be confined to specific and secured areas Chemicals must be stored in a bunded area with an impermeable base (e.g. concrete or plastic lining).
- The accidental or negligent spillage of any fuels or potentially hazardous substances must be cleaned up immediately using the most appropriate methodologies, equipment and materials.
- Necessary materials and equipment and chemicals are available on the site to deal with spills of any of the hazardous materials present.
- A procedure must be put in place to distinguish between those spills that can be cleaned up by the Contractor and those that will require specialist input. The name and contact numbers of various clean up companies must be posted and visible at the camp office.

<ul style="list-style-type: none"> • Any contaminated soil or water must be removed and stored in a skip until it can be disposed of at an appropriate disposal site. • CEMP standard forms must be available on site to record the details of any environmental incidents (date, time, cause, action taken). 	
<p><i>MITIGATION MEASURES RELATED TO SOCIO-ECONOMIC ENVIRONMENTAL IMPACTS</i></p>	<p><i>RESPONSIBILITY</i></p>
<ul style="list-style-type: none"> • Local labour (male and female, skilled and unskilled) should be employed as a priority. • Workers are to be made aware that employment is only temporary and will cease at the end of the contract period. Where possible, employment of local persons should be used for capacity building. 	<p>Project Engineer & Contractors,</p>
<ul style="list-style-type: none"> • Surrounding communities are to be informed of any inconveniences caused by the construction activities. • A complaints line is to be made available and incidents are to be addressed and recorded. • I&AP's need to be made aware of the existence of the complaint register and the methods of communication available to them. 	<p>Project Engineer & Contractors, MET & CoW: ED</p>

7. CONCLUSIONS

The EMP will form basic tool for reducing the magnitude of impacts and suggesting practical measures to attain this. It is also used to measure compliance by the applicant. It is a tool that gives guidance during monitoring, auditing and taking corrective actions during its implementation, thereby ensuring continuous monitoring of the environment. This EMP was developed after an environmental assessment. Conditions of the authorisation from the Competent Authority should be incorporated and implemented in complement to this EMP.

Key sustainability principles to be emphasised include:

- Development must not irreversibly degrade the natural, built and socio-economic environments.
- Current actions should not cause irreversible damage to natural resources.
- Land use and environmental planning need to be integrated.