Scoping Report: Vryburg Waste Water Treatment Works

2013

By EndemicVision Environmental Services

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

ABP	Area Based Plans
ADWF	Average Dry Weather Flow
ASGISA	Accelerated and Shared Growth Initiative for South Africa
BEE	Black Economic Empowerment
BID	Background Information Document
BNR	Biological Nutrient Removal
BoD	Basis of Design
C&RR	Comment & Response Report
CBO	Community Based Organizations
CDW	Community Development Worker
DMA	District Management Areas
Dr RSM DM	Dr Ruth S Mompati District Municipality
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
ESIA	Environmental & Social Impact Assessment
EVES	EndemicVision Environmental Services
FSR	Final Scoping Report
GAA	Golder Associates Africa
GDP	Gross Domestic Product
I & AP	Interested & Affected Parties
IDP	Integrated Development Plan
LED	Local Economic Development
LRAD	Land Redistribution for Agricultural Development
LUMS	Land Use Management System
NEMA	National Environmental Management Act
NGO	Non-Governmental Organization
NSDP	National Spatial Development Perspective
NWA	National Water Act
OFC	Onno Fortuin Consulting
PPP	Public-Private Partnerships
PWWF	Peak Wet Weather Flow
SDF	Spatial Development Framework
SMME	Small, Medium and Micro-sized Economies
TB	Tuberculosis
WWTW	Waste Water Treatment Works

1. PURPOSE OF THE REPORT

Dr RSM DM(herein referred to as Dr RSM), in the North West Province of South Africa, intends to construct a new waste water treatment works (WWTW) and associated infrastructure near the town of Vryburg.

Vryburg is located within the Naledi Municipality of the Dr RSM District Municipality. Vryburg is an important transport hub with some major transport links leading through Vryburg. The N14 Road linking Gauteng with Upington and Namibia runs through Vryburg. The N18 road links Botswana through Mahikeng to Kimberley and Cape Town[1] is also an important service centre for extensive commercial farming. The map below is a locality map showing the proposed site where construction is to begin (**Error! Reference source not ound.**).

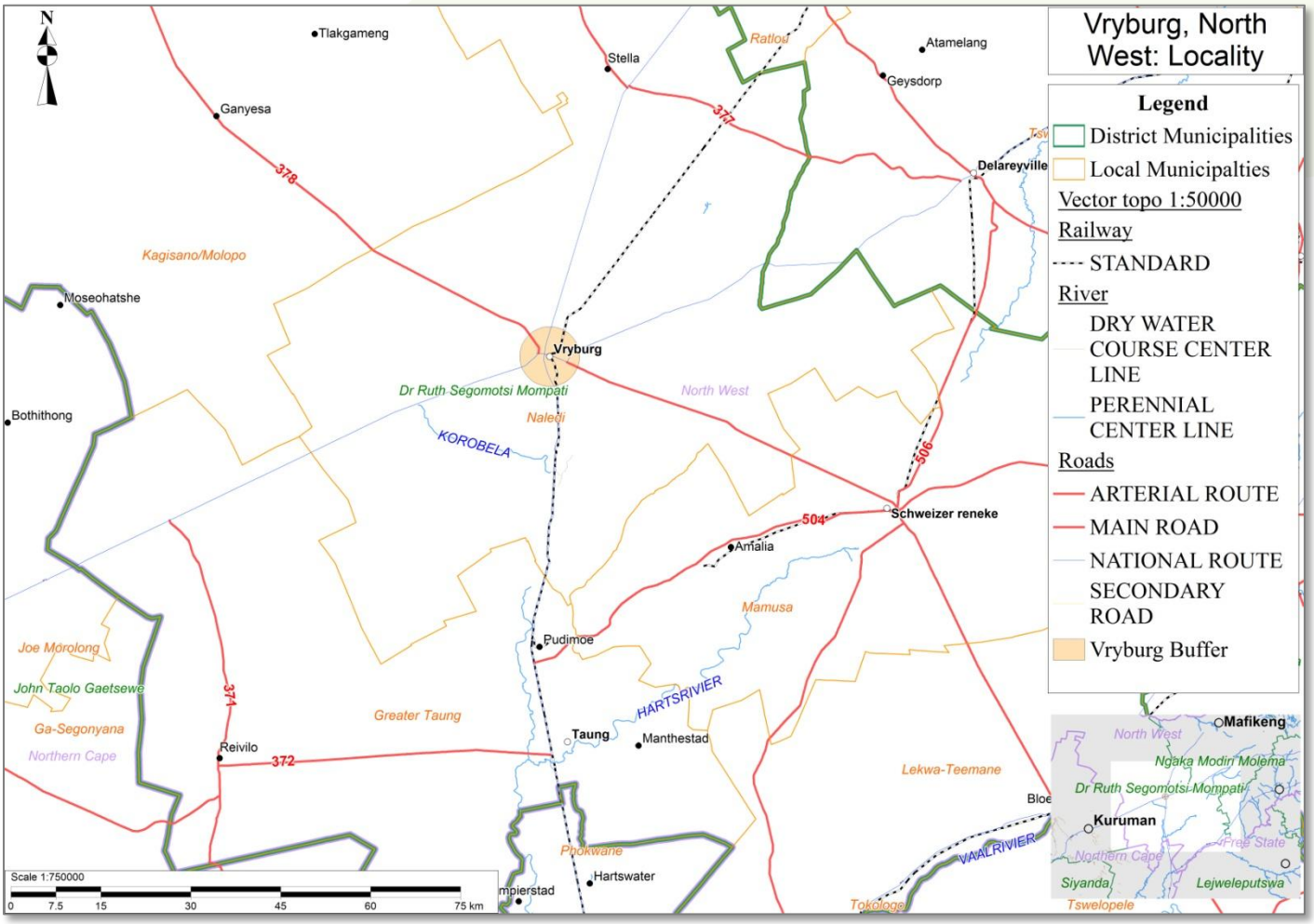

FIGURE 1: LOCALITY MAP OF VRYBURG

The motivation for the construction of an entirely new plant is as follow: The current WWTW in Vryburg was constructed in 1982 with a hydraulic load capacity of 4800 m^3 per day. Since then upgrades have been implemented, but the existing treatment works is under tremendous strain and it can hardly cope with the current flow and load of 6500 m^3 per day. These new works require numerous environmental authorizations.

[1] Golder Associates Africa (Pty) Ltd. (2009). *Vryburg Waste Water Treatment Works. Technical Report: Existing Treatment Works.* Vryburg: Golder Associates Africa (Pty) Ltd.

EndemicVision Environmental Services (EVES) has been appointed as the independent environmental assessment practitioner, to undertake the ESIA as well as associated public participation processes.

EVES present this scoping report to the client, project team, authorities, key stakeholders identified thus far and general public with the purpose to:

- identify the issues of concern that should be addressed in the EIA and Specialist Studies
- design the required work to understand and evaluate these issues, and to address shortcomings in existing information define the scope of the project and the studies to be done in a way which would result
- In a thorough and scientifically defensible Environmental Impact Report (EIR) at the end of the EIA to ensure that the proposed development will be executed in an environmentally sound manner.

The sub-objectives of Scoping, which are directed at laying the foundation for the EIA, are as follows:

- identify and inform a broad range of stakeholders about the proposed development, to empower them with sufficient information to be able to make meaningful contributions to the project, and to provide ample opportunity to all parties to exchange information and express their views and concerns;
- obtain the buy-in of the stakeholders for the EIA process *per se*, so that they will accept the ultimate findings of the EIA;
- understand and fully document the issues underlying the concerns and questions raised by stakeholders, for the purpose of avoiding misunderstandings and controversy during later phases of the EIA, and
- To focus the study on reasonable alternatives and relevant issues.

2. INTRODUCTION

2.1. BACKGROUND TO VRYBURG WWTW

Vryburg expanded beyond the capacity of its bulk services, specifically the Sewage Treatment Services with various housing developments since 2009. Three phases of developments are expanding the town by 6500 housing units excluding associated commercial enterprises developing from this expansion[2].

Since 2008 public concern has been raised about the Vryburg WWTW and AfriForum addressed the Naledi Municipality for the dumping of sewage in the Harts River at the Vryburg WWTW to cease. A query was raised thereafter by Mrs. A.T. Lovemore for attention of the Minister of Water and Environmental Affairs "Whether, with reference to sections 19 and 151 of the National Water Act, Act 36 of 1998, any failures to comply with directives issued in terms of section 19(3) have occurred in the past year; if so, (a) what action has been taken by her department against the offending party and (b) what are the further relevant details in each case?" After which the Naledi Municipality had to compile a remedial action plan addressing the management and maintenance of the WWTW and sewage water quality[3].

With reference to the above Dr RSM District Municipality commissioned a meeting in March 2009 between Golder Associates Africa (Pty) Ltd (GAA) and Onno Fortuin Consulting (OFC) regarding the current status of the Vryburg WWTW to resolve these concerns. During this meeting it was confirmed that the existing treatment works is under tremendous strain and it can hardly cope with the current flow and load. Various new developments within Vryburg have been approved recently and this will directly impact upon the current and future capacity of the existing works. Since this time a technical working group was commissioned with local and district municipal role players to find the best way forward.

TABLE 1: TECHNICAL WORKING GROUP FOR THE VRYBURG WWTW

Organization	**Role**
Naledi Local Municipality	Water Services Provider and WWTW Manager
Dr RSM District Municipality	Water Services Authority & WWTW Owner
Onno Fortuin Consulting	Project Manager
Golder & Associates	Design Engineers
EndemicVision Environmental Services	Independent Environmental Assessment Practitioner

A technical assessment of the existing Works was then done and it was determined that the existing Works cannot be upgraded and should be re-built elsewhere. A feasibility study for the viability of a possible new works was then conducted based on the Department of Water Affairs and Forestry (DWAF) guideline format and policies.

2.2. PROPERTY DETAILS

The site for the construction of the new plant is on Portion 2 of Rosendal 673 farm. This portion of the farm is situated south east of Vryburg and Huhudi. The piece of land where the sewage works will be constructed will be bought from the landowner by Dr RSM. The property will a sub-division of the existing farm and be rezoned from agriculture to industrial. Purchasing a part of the property has been evaluated as the best option for this project compared to a 99 year lease, servitude or purchasing the whole farm and will ensure

[2] Golder Associates Africa (Pty) Ltd. (2009). *Vryburg Waste Water Treatment Works. Technical Report: Existing Treatment Works.* Vryburg: Golder Associates Africa (Pty) Ltd.
[3] Afri-Forum. (2008). *Afri-Forum address Vryburg Sewage Problem*. Retrieved from https://www.afriforum.co.za

that future expansions will easily take place and management and access is secured for the district municipality (Figure 2).

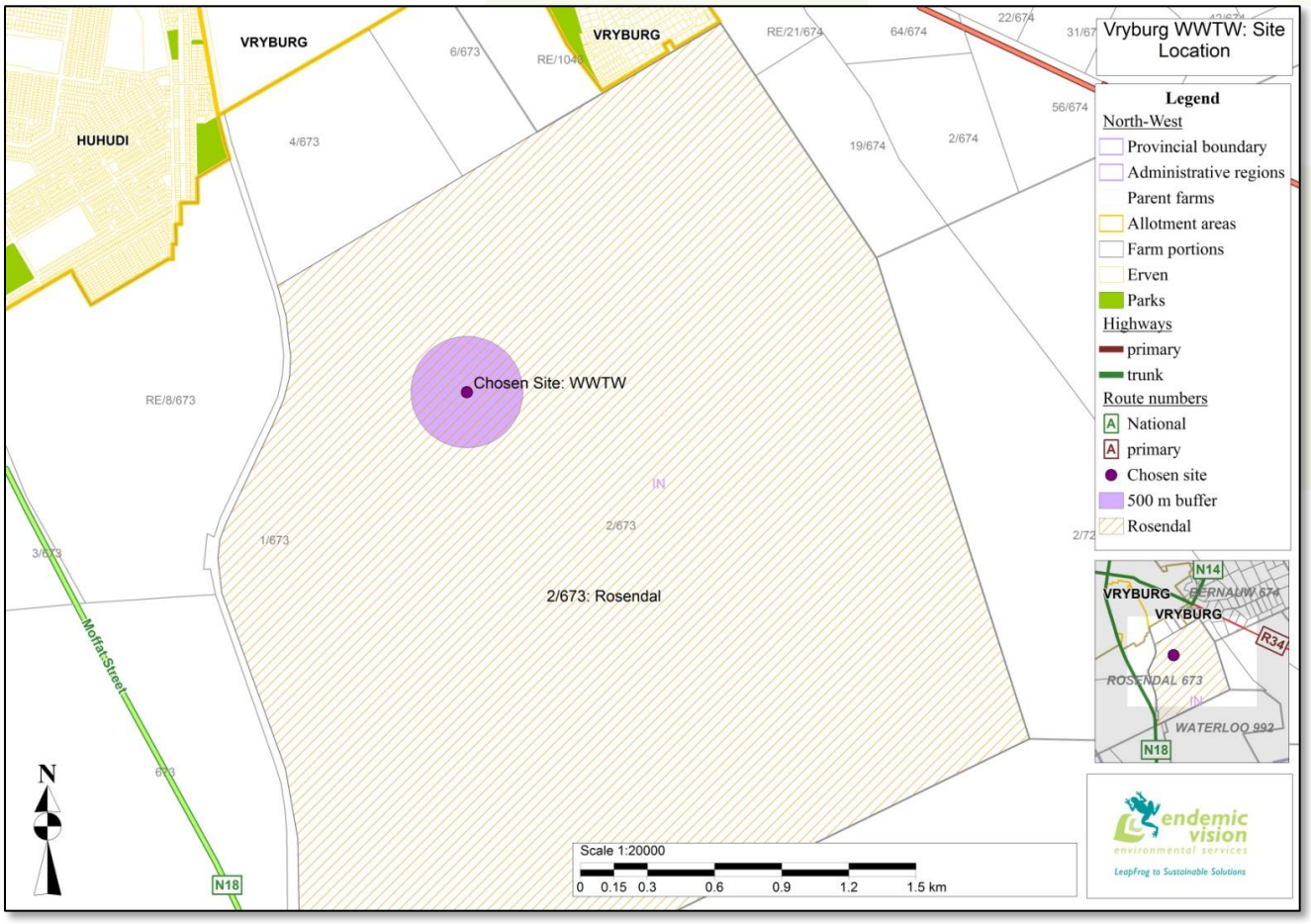

FIGURE 2: SITE MAP OF THE PROPOSED VRYBURG WASTE WATER TREATMENT WORKS

BROADER POLICY

2.2.1. NORTH WEST PROVINCIAL GROWTH AND DEVELOPMENT STRATEGY

The purpose of the North West Provincial Growth and Development Strategy is to provide a framework for integrated and sustainable growth and economic development for the North West Province and its people over the next ten years (2004-2014). The strategy provides the provincial government with a guideline on what and how to achieve its sets objectives. It forms the benchmark from which progress and achievements are monitored and evaluated.

The strategy is the result of support and co-operation offered by social partners who took part in the Provincial Growth and Development Summit held in August 2004. It also represents the alignment of development strategies by all spheres of government.

The following goals were set by the North West Government and social partners when the Province hosted a Provincial Growth and Development Summit, under the theme entitled "Building a People's Contract for Sustainable Growth and Development in the North West":

> Building an enduring partnership through the promotion of a shared vision of South Africa's growth and economic development strategy, to frame sector and development agreements and lay the basis for partnerships in action, addressing urgent challenges by selecting from many possible interventions those which hold the promise of the greatest possible impact in the shortest possible time for accelerated investment, job creation, improved efficiency and productivity, greater social equity, and a fairer distribution of economic opportunities and rewards, while undertaking serious social dialogue within broad policy frameworks, securing the commitment and active participation of all constituencies in those areas identified for prioritized actions in ways that build on lessons learnt from development programmes.

The objectives as articulated above will be realized through a consolidated Programme of Action and Project Register that will result from continued interaction between partners at Working Group level and will be produced annually to complement the implementation of the Provincial Growth and Development strategy.

VISION, GOALS AND OBJECTIVES

VISION

Guided by the policy and strategic framework established, the vision for 2014 is:

> *To build a truly united, non-racial, non-sexist, democratic and prosperous society that is jointly focused to deliver on key priorities aimed at growing a vibrant economy.*

In promoting this vision, the Province intends to build a society that by 2014 will have:

- *Developed economic sectors and spatial localities in accordance with the needs and potential of the people through the sustainable use of resources and the protection of the environment;*
- *Delivered on the constitutional obligation to provide basic services to all citizens;*
- *Promoted job creation and skills training;*
- *Addressed past and current social inequalities by focusing on people and developing strategies to avoid geographic inequalities,*
- *Supported full participation of and equal opportunities to all people;*
- *Offered the poor skills development and employment opportunities to exercise choices in improving their quality of life and work together towards a single and integrated economy in a dignified manner, and*
- *Fully capacitated the SMME sector.*

GOALS AND OBJECTIVES

The challenges to fight poverty and unemployment, improve the low level of expertise and skills are both immediate and long term and require primary goals for sustained growth and economic development as follows:

> The 'Economic Goal' requires an average economic growth rate of 6.6% per annum, to halve unemployment over a ten-year period. This is considered the minimum economic growth that would create enough capacity and momentum to place the province on a virtuous cycle of integrated and sustainable growth and development during the next 10 years. The investment requirement to achieve this average growth rate from both the private and public sector is estimated at R6.3 billion per annum.

The Poverty Eradication Goal to wipe out the 'basic needs' backlog in accordance with the provisions of the Constitution and prepare the poor for future growth and development, as calculated from the 2001 population statistics supplied by Stats SA and included projections for new households expected to enter the market, will annually require investment estimated at R854 million per annum.

Transversal objectives that must be promoted at all levels of interaction in the province to support the two macro goals are:

- Implementing a Public Sector Employment Programme (EPWP)
- Ensuring cooperative governance and the formation of Public-Private-Partnerships (PPP's);
- Promoting equal and fair access to opportunities and assets;
- Enhancing competitiveness, profitability and SMME development; and
- Ensuring sustainable development through resource and environmental management.

2.2.2. DR RUTH S MOMPATI LOCAL ECONOMIC DEVELOPMENT STRATEGY

The Strategy Review is intended to bring the District Economic Development Strategy in line with the principles and guidelines contained in a wide range of Provincial and National documents.

The specific objectives of the project include the revision of the District Economic Development Strategy to address the following:

- Changes which have taken place at a global or regional level have an influence on the economy of the District.
- Changes at National and Provincial level having an influence on the economic performance of the District.
- Alignment of the Strategy with the focus areas of the District IDP and the respective local municipality's IDPs.
- Alignment of the Strategy with the Spatial Development Framework of the Province and the District Alignment of the Strategy to the various Economic Sector Plans.
- Alignment of the Strategy to ASGISA
- Identification of strategic projects at the District level
- Identify issues common to local municipalities at policy and guideline level in order to achieve a common approach to the challenges within the District.
- The competitive assessment of the strengths, weaknesses, opportunities and threats with reference to the economy of the District.
- The institutional arrangements for the implementation of the Economic Development Strategy.
- The identification of Economic Development Strategies and Actions which will ensure the realization of the vision and mission of the 2008/09 Economic Development Strategy.

The World Bank Approach to Economic Development will be adopted for the purpose of realizing the objectives of the project. The approach is a five stage approach within which the scope of work for the project falls. The approach to Economic Development Strategy Review will be as follows:

2.3. DESCRIPTION OF RECEIVING ENVIRONMENT

2.3.1. BIOPHYSICAL

According to Tainton[4], climate in the broad sense is a major determinant of the geographical distribution of species and vegetation types. Chambers[5] gives the definition of climate as the following: "the average weather conditions of a particular region of the world over a long period of time, with regard to temperature, rainfall, air pressure, etc." Within areas, the local conditions of temperature, light, humidity and moisture vary greatly and these factors which play an important role in the production and survival of plants. In terrestrial environments, limitations related to water availability are always important to plants and plant communities. The spatial and temporal distribution of rainfall is very complex and has great effects on the productivity, distribution and life forms of the major terrestrial biomes[6]. Furthermore, aspects like topography, slope and altitude may further result in differences in precipitation and water availability to plants within the study area.

Vryburg is situated in a semi-arid summer rainfall climate zone. Vryburg normally receives an average of 344 mm of rain per year, with most rainfall occurring mainly during summer months. The chart below shows the average rainfall values for Vryburg per month. It receives the lowest rainfall (0 mm) in June and the highest (70 mm) in February. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Vryburg range from 19°C in June to 32.9°C in January. The region is the coldest during July when the mercury drops to 0°C on average during the night. Consult the chart below for an indication of the monthly variation of average minimum daily temperatures[7]. Figure 3 is a chart of the average rainfall as well as midday and night time temperatures that occur in Vryburg.

[4] Tainton, N. (1981). *Veld and pasture management in South Africa.* Pietermaritzburg, South Africa: Shuter and Shooter.
[5] Chambers Dictionary. (2012). *Search Chambers*. Retrieved April 29, 2013, from The Chambers Dictionary Online: http://www.chambers.co.uk/search.php?query=climate&title=21st
[6] Barbour, M., Diamond, J., & Yoder, C. (1996). Biological assessment strategies: Applications and Limitations. In D. Grothe, K. Dickson, & D. Reed-Judkins, *Wholoe effluent toxicity testing: An evaluation of methods and prediction of receiving system impacts.* Pensecola, Florida: SETAC Press.
[7] SAexplorer. (2011). *Vryburg Climate*. Retrieved April 25, 2013, from SA Explorer: http://www.saexplorer.co.za/south-africa/climate/vryburg_climate.asp

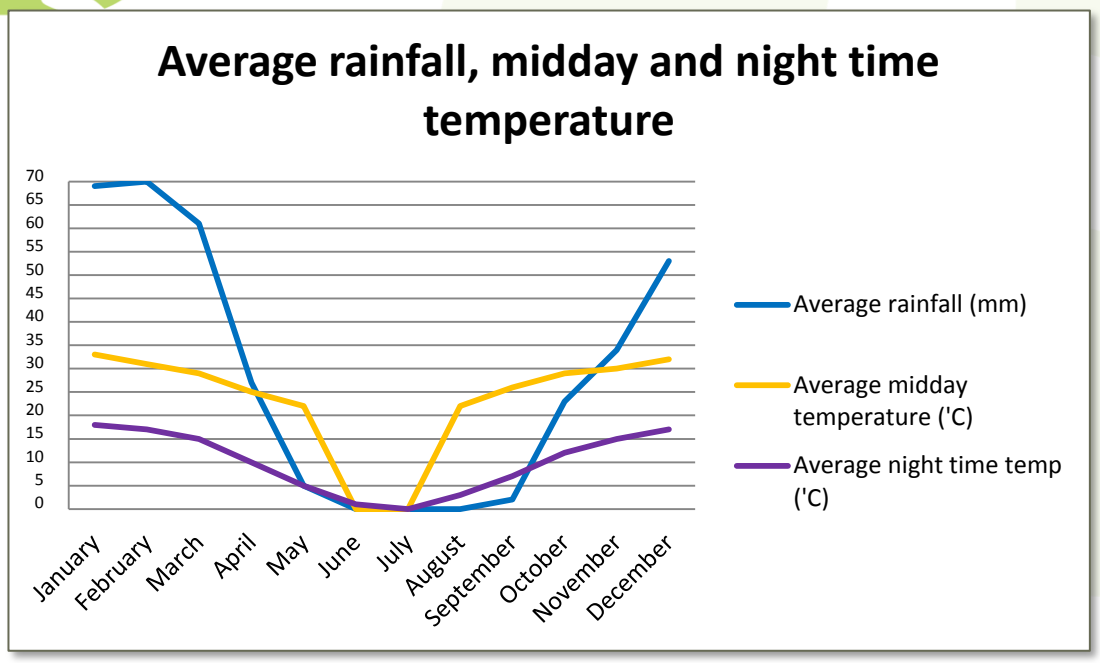

FIGURE 3: CHART OF THE AVERAGE RAINFALL, AVERAGE MIDDAY TEMPERATURE AND AVERAGE NIGHT TIME TEMPERATURE

This prominent escarpment, averaging c. 100 m in relief and 1150 to 1200 m in elevation, extends some 280 km from 27.7°S near Vryburg to 29.7°S near Douglas, trending from northeast to southwest. The cliffed escarpment (40-70°) and the generally flat plateau (less than 0.5°) are formed of gently warped, Precambrian dolomites of the Transvaal System. The scarp rim is angular, the foot slope more often smooth concave, averaging 25° as it descends onto a rock-cut plain descending to the valley margins of the Vaal and Harts rivers. Drainage lines have incised short, V-shaped gorges along the edge of the escarpment. In some of these gorges, water flowing over the surface of the tufa is still today adding to the tufa mass. The escarpment is well developed south of Ulco, where relief attains 90- 120m[8].

2.3.2. Topography and Soils

The topography of the three sites is similar in nature. It is sloping moderately, becoming flat towards the river that is situated east of the site. Regional drainage occurs to the South. Figure 4 show a topographical map of Vryburg.

The northern and western parts of the area are completely covered by Aeolian sand of the Kalahari Group which overlies the undifferentiated granite gneiss of Swazian age. The oldest rocks or the basement complex comprise mainly low grade metamorphic rocks which also form part of the Kraaipan Group[9]. Granite and gneiss cover a substantial part of the area. It is, however, rarely exposed due to a thick cover of Kalahari sand (Gordonia Formation) in the western and north western part of the area and a thick soil cover. The basement granite-gneiss comprises migmatite, gneiss, granite, amphibolite and schist.

[8] Butzer, K. (1974). Paleoecology in South African Australopithecines: Taung revisited. *Current Anthropology 14:4* , 367-382.
[9] Keyser, N., & Du Plessis, C. (1993). *The geology of Vryburg Area.* Pretoria: Government Printer.

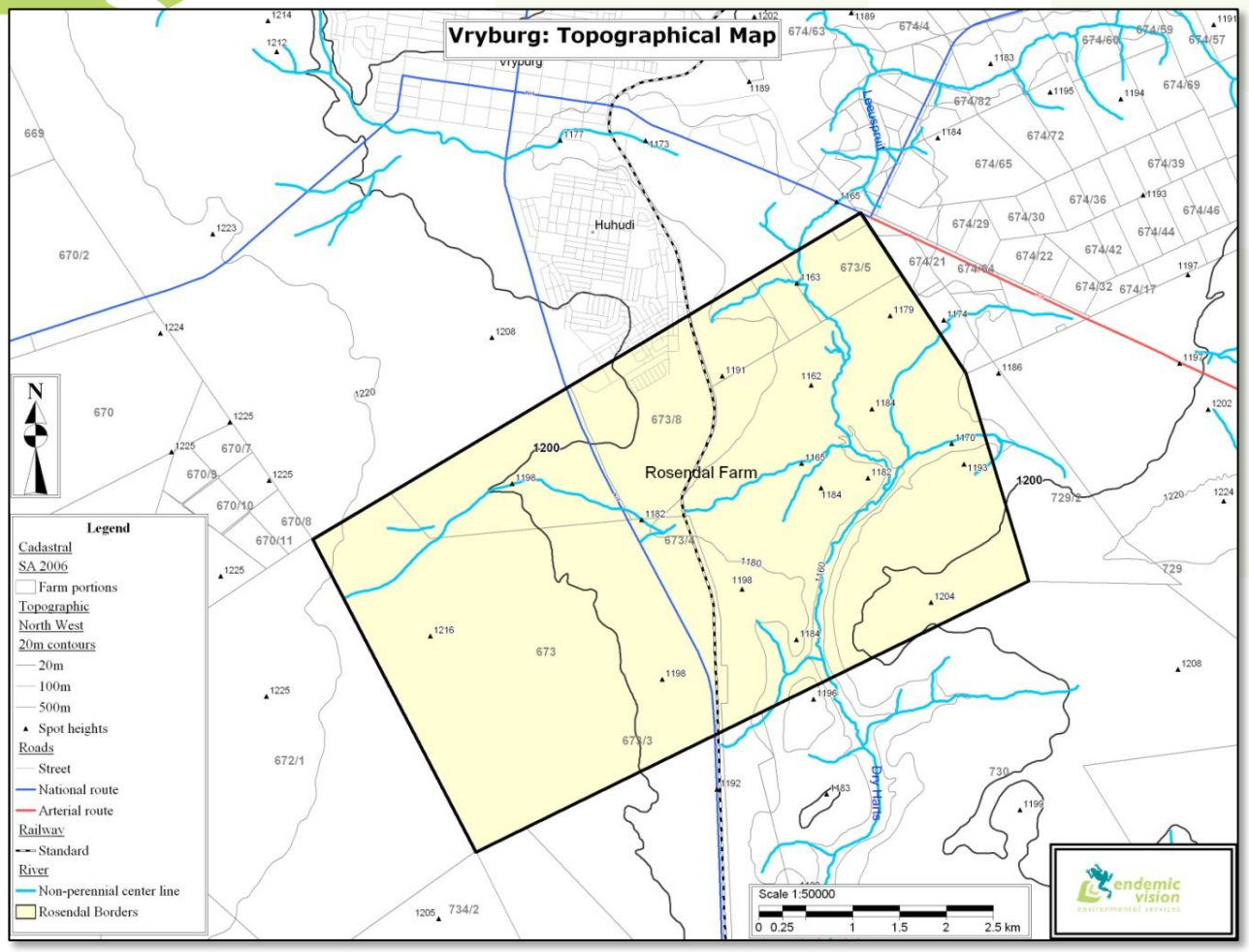

FIGURE 4: TOPOGRAPHICAL MAP OF ROSENDAL 673

2.3.3. GEOLOGY

The greater part of farm Rosendal 673 is underlain by *Permocarbonifeorus* glacial sediments of the Dwyka Group (Karoo Supergroup, C-Pd). In the Vryburg region this succession mainly consists of glacial tillite (boulder mudstone) and interglacial shale. Exposures levels are typically very poor, since the mud rock matrix weathers very readily, and consequently the Dwyka outcrop area represented at surface only by scattered erratic boulders[10].

Glacial striations of Dwyka age incised into older resistant quartzitic rocks of the Vryburg Formation on the farm indicate southerly ice transport directions[11]. Northern outcrops of the Dwyka Group may contain low diversity non-marine trace fossil assemblages (predominantly fish and arthropod traces, *Rhizocorallium*) within interglacial mud rocks as well as scattered vascular plant remains (e.g. *Glossopteris* leaves, petrified wood) but the likelihood of significant fossil heritage in the Vryburg area is considered to be low.

In the southern and eastern portions of Rosendal 673 much older sedimentary rocks of the *Schmidtsdrif Subgroup* crop out where the Dwyka cover rocks have been removed by erosion. These ancient Precambrian rocks are almost flat-lying, with a gentle dip towards the south. This is the basal subdivision of the *Late Achaean* to *Early Proterozoic Ghaap Group* (Transvaal Supergroup) in the Griqualand West Basin, Ghaap Plateau Subbasin. Useful reviews of the stratigraphy and sedimentology of these Transvaal Supergroup rocks

[10] Keyser, N. & Du Plessis, C.P. 1993. The geology of the Vryburg area. Explanation to 1: 250 000 geology sheet 2624 Vryburg, 28 pp. Council for Geoscience, Pretoria.
[11] Schutte, I.C. 1994. Die geologie van die gebied Christiana. Explanation to 1: 250 000 geology sheet 2724 Christiana, 58 pp. Council for Geoscience, Pretoria.

have been given by Moore *et al.*[12] and Eriksson and Altermann[13]. The Ghaap Group represents some 200 Ma of chemical sedimentation - notably iron and manganese ores, cherts and carbonates with subordinate silicastic rocks - within the Griqualand West Basin that was situated towards the western edge of the Kaapvaal Craton.

Importantly, intrusions of dolomite are known in the area and a geotechnical survey required to ensure no development will take place on dolomitic zones.

2.3.4. FAUNA & FLORA

The vegetation in the Vryburg area falls into the Savanna Biome and more specifically in the Ghaap Plateau Vaalbosveld group (Figure 5). The map below shows the area where the proposed development will take place (the highlighted part is the farm Rosendal where two of the proposed sites are situated)[14]. Mucina & Rutherford[15] describes the vegetation and landscape features as a flat plateau with well-developed shrub layer with *Tarcho camphoraturs* and *Acacia karroo*. The open tree layer has *Olea europaea subs. Africana, A. tortilis, Ziziphus mucronata* and *Rhus lancea* are more important in the southern parts of the unit, while *A. tortilis, A. hebeclada* and *A. mellifera* are more important in the north and part of the west of the unit[16]. Much of the south-central part of this unit has remarkable low cover of *Acacia* species for an arid savanna and is dominated by the non-thorny *T. camphoratur, R. Lancea* and *O. europaea subs. africana*. Vegetation along the escarpment cliffs is sparse, but open woodlands are present in the gorges. Common species include Namaqua Fig *Ficus chordata*, White Stinkwood *Celtis africana* and False Olive *Buddleja saligna*[17].

[12] Moore, J.M., Tsikos, H. & Polteau, S. 2001. Deconstructing the Transvaal Supergroup, South Africa: implications for Palaeoproterozoic palaeoclimate models. African Earth Sciences 33, 437-444.
[13] Eriksson, P.G. & Altermann, W. 1998. An overview of the geology of the Transvaal Supergroup dolomites (South Africa). Environmental Geology 36, 179-188.
[14] Anderson, M., & Hohne, P. (2007). An aerial survey of raptors along the Ghaap Plateau escarpment, Northern Cape Province, South Africa. *Gabar 18:1* .
[15] Mucina, L., & Rutherford, M. (2006). *The vegetation of South Africa, Lesotho and Swaziland.* Pretoria: Strelitzia 19.
[16] Mucina, L., & Rutherford, M. (2006). *The vegetation of South Africa, Lesotho and Swaziland.* Pretoria: Strelitzia 19.
[17] Butzer, K. (1974). Paleoecology in South African Australopithecines: Taung revisited. *Current Anthropology 14:4* , 367-382.

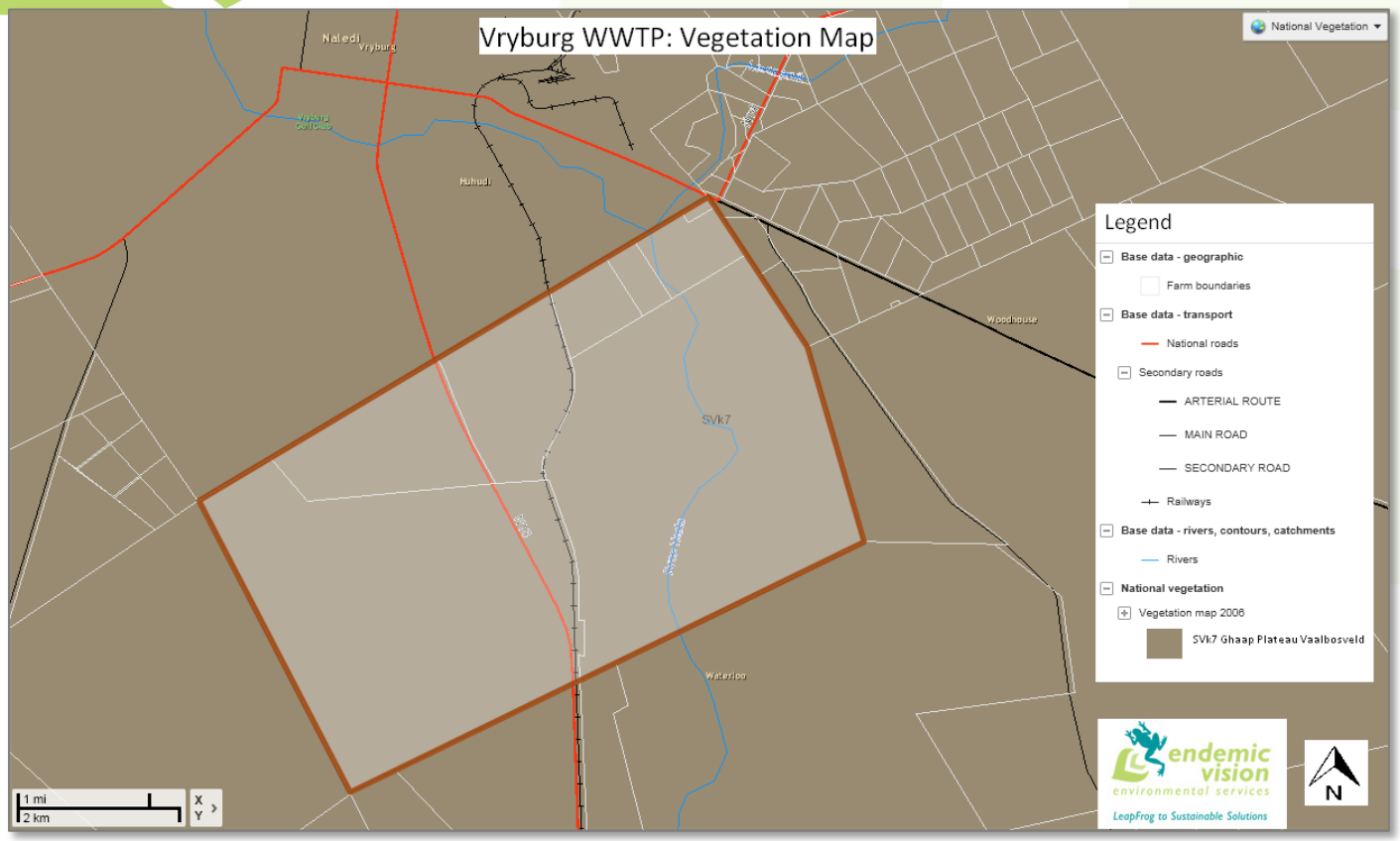

FIGURE 5: VEGETATION MAP OF THE AREA OF THE PROPOSED SITES. THE FARM ROSENDAL IS HIGHLIGHTED

2.3.5. SOCIO-ECONOMIC CONTEXT

NORTH WEST PROVINCE

The North West Province has four District Municipalities (DMs) comprising Bojanala Platinum, Ngaka Modiri Molema, Dr Ruth Semogotsi Mompati, and Dr Kenneth Kaunda. The executive authority of the North West lies with the Premier and this authority is executed in conjunction with other members of the Executive Council[18]. The Province is governed by the following Departments:

- North West Agriculture, Conservation, Environment and Rural Development
- North West Economic Development, Conservation, Environment and Tourism
- North West Education and Training
- North West Finance
- North West Health
- North West Human Settlements, Public Safety and Liaison
- North West Local Government and Traditional Affairs
- North West Office of the Premier
- North West Provincial Government
- North West Provincial Legislature
- North West Public Safety
- North West Public Works, Roads and Transport
- North West Social Development, Women, Children and Persons with Disabilities
- North West Sport, Arts and Culture

[18] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

The department which will play a significant role in the Project is the Department of Economic Development, Environment, Conservation and Tourism which is the provincial arm of the National Department of Environmental Affairs. The National Department of Environmental Affairs will be the Commenting Authority on the project.

DR RUTH SEMOGOTSI MOMPATI DISTRICT MUNICIPALITY

The Dr RSM DM comprises six local municipalities namely, Naledi Local Municipality (in which the proposed sites for the WWTW are located), Greater Taung Local Municipality, Lekwa-Teemane Local Municipality, Schweizer-Reneke Local Municipality, and the Kagisano/Molopo Local Municipality. This district municipality was one of the few municipalities whose municipal boundaries are not affected by the District Management Areas (DMA). The executive authority of the Dr RSM DM rests with the Executive Mayor[19].

The regional centre of the Dr RSM District Municipality is Vryburg. Strategic development within the Dr. RSM District Municipality is aligned with the District Growth and Development Strategy and other national development initiatives. Although 2011 Census statistics show that the Dr. RSM District Municipality has come a long way in terms of service and infrastructure delivery, some communities still experience a lack of basic services. For example, 27.7% of households still do not have access to electricity, 67.9% of households have no access to formal refuse removal, 41.2% do not have access to reasonable levels of sanitation, and 44% still do not have acceptable levels of access to piped water. Even though the municipality struggles to provide the necessary basic services to the community, its 2007-2011 IDP concentrates heavily on the provision of infrastructure and basic services and have started the process of identifying spatial areas with development potential[20].

The North West Local Economic Development (LED) Strategy recognized fifteen driving forces crucial for the renewal of the Dr. RSM District's economy which was identified in an opportunity analysis:

- SMME Sector
- New employment opportunities
- Youth entrepreneurship
- Women entrepreneurship
- Community projects and Co-operatives
- Employment generating community infrastructure projects, i.e. Hawker Settlements
- BEE
- Research and development Support to existing businesses.
- Creation of Industrial Clusters
- Investment promotion
- Agro-Processing Sector, i.e. Food Extrusion Project
- Manufacturing Sector
- Mining Sector
- Growth and development of the Tourism Sector
- Exports

[19] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[20] Dr. Ruth S. Mompati District Municipality. (2010). Integrated Development Plan, 2007-2011. Vryburg.

NALEDI LOCAL MUNICIPALITY

Naledi Local Municipality (LM) is situated within the central part of Dr. Ruth Segomotsi Mompati District Municipality within the North West Province. The total area covered by Naledi LM is 4 250 077 km^2. The main urban areas of Naledi LM are Vryburg and Stella[21].

The authority of the District Municipality lies with (30) elected councilors inclusive of five (5) tribal authority leaders (dikgosi) as the district is + 60% rural. A total of 10 councilors are elected in terms of a system of proportional representation (directly elected), and 15 represent local municipalities. Only the mayor/speaker is full-time employees. These councilors represent local government in the various towns and work closely with local government departments. The role of the councilors is to monitor and maintain existing service delivery such as water, sanitation and refuse removal and to initiate new projects within the communities. Councilors work closely with the Community Development Workers (CDWs). These are local people employed by the Department of Housing and Local Government. The role of these CDWs is to represent their communities at the local and district government level and to identify potential development opportunities and needs[22].

The role of the LM is to monitor and manage service delivery to settlements within its jurisdiction, implement plans and policies of the Dr. RSM District Municipality and to carry out the development objectives outlined within the LED.

The strategic objectives of the LM are to:

- provide sustainable services to the inhabitants and to maintain existing resources;
- develop the LM as an institution through transformation and capacity building;
- promote local economic development through poverty alleviation, job creation, empowerment of the previous disadvantage people with capacity building in business skills and establish a climate for investment; and promote sound financial management and viability[23]

Key priorities for the LM between 2012 and 2017 include:

- Basic Service Delivery and Infrastructure Investment;
- Municipal Transformation and Institutional Development;
- Financial Viability and Financial Management;
- Good Governance and Community Participation and
- Local Economic Development

POLITICAL ADMINISTRATION

The ANC has the majority vote in the municipality, occupying six places in the municipal council and the DA and COPE each taking only one seat each.

[21] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[22] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[23] Naledi Local Municpality. (2010/2011). *Naledi Local Municipality IDP & Budget.* Vryburg: Naledi Local Municipality.

POPULATION STATISTICS

DR RUTH S. MOMPATI DISTRICT MUNICIPALITY

Dr RSM District Municipality is the largest out of the four District municipalities in the North West Province, but it has the smallest population out of the four districts in the province. On the basis of the most recent statistics contained in the Community Survey report of 2007, the population of Dr RSM has decreased from 432 069 in 2001 to 354 554 in 2007. Taking into account the population figure indicated in the 2001 population census (i.e. 432 069), the District has lost a large number of people to the neighboring provinces and districts[24].

This decline in population takes into cognizance the boundary changes made to Kagisano in 2006 (constituting approximately 7000 demarcated people) and echoes the NSDP statements made about migration from Dr Ruth S. Mompati District Municipality to the bigger cities and metropolitan areas[25].

The Global Insight Data however estimate the 2001 population figures at 483 643 and an annual increase of 1.1% resulting in 504 053 in 2005. The Demarcation Board echo this data with an estimate of 509 703 in 2006. These figures do not take into effect the boundary changes to Kagisano in 2006 and do not estimate a decrease, but allow an increase of 1.1%. The amount of households are also estimated at approximately 100 000 (Dr Ruth S Mompati District Municipality, 2012)[26].

Taking into account the large geographical size of the District and the smaller population out of the four Districts within the province, Dr RSM has the lowest density of people per square km, which makes the provision of municipality services in some parts of the District costly and almost impossible in certain cases.

The estimated average population growth rate for the Dr Ruth S Mompati District Municipal Area was 0.4% for the year 1996 to 2009, the lowest in the North West Province. Overall, there has been an increase and decrease of population within Dr RSM DM which can be attributed to various factors such as lack of employment in the area and eviction of farm workers moving into the area from different farms.

NALEDI LOCAL MUNICIPALITY

The local municipality of Naledi consists of 66 468 people (2012) which translates to 17 020 households with an average household size of 3.8 people per household. Population growth is calculated to be 1.0%[27].

AGE

According to Global Insight survey 2009, Dr RSM DM has quite a number of youth throughout. The population group between 00-04 is at (10%) of the district, ages 05-09 provide (12%) of the population. There is further increase on the category of 10-14 which is (11%) of the population. Children between 15-19 are at (10%) of the district population. The total of the above is at 212 066 of the population. Therefore the entire population of the ages 00-19 is at 43% of the entire population of the district (Dr Ruth S Mompati District Municipality, 2012)[28].

The population group between 35-39 is at (6%) of the district, ages 40-44 provide (5%) of the population. There is further or similar number on the category of 45-49 which is (5%) of the population. Individuals who fall on the economic active population between 50-54 are at (5%) of the district population. The total

[24] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[25] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[26] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[27] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.
[28] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

of the above is at 103 637 of the population. Therefore the entire population of the ages 35-54 is at 21% of the entire population of the district[29].

We can regard the above to be regarded as the economic active population within the district though it the report does not exclude population 20-34 which we assume form part of this category[30].

11.0% of the population is between 10 – 14 years old and the Naledi Local municipality is characterized by a younger population, mostly between 0 and 19 years. The figure below shows the age profile for the Naledi Local Municipality[31].

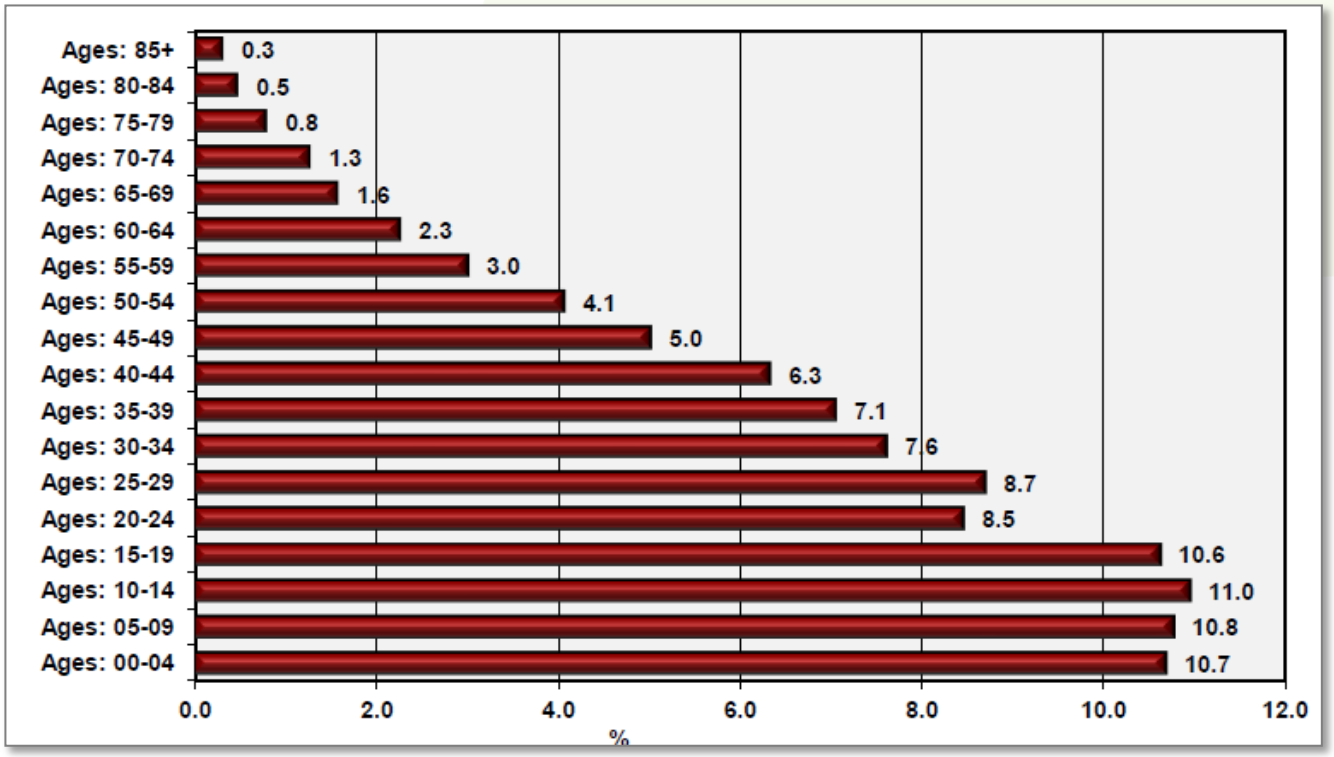

FIGURE 6: AGE DISTRIBUTION IN NALEDI LOCAL MUNICIPALITY

GENDER

According to the Local Municipality's figures, 51% of the population is female and 49% are male[32]. The figure below gives a visual representation of the female to male ration in the Local Municipality.

[29] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[30] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[31] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.
[32] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.

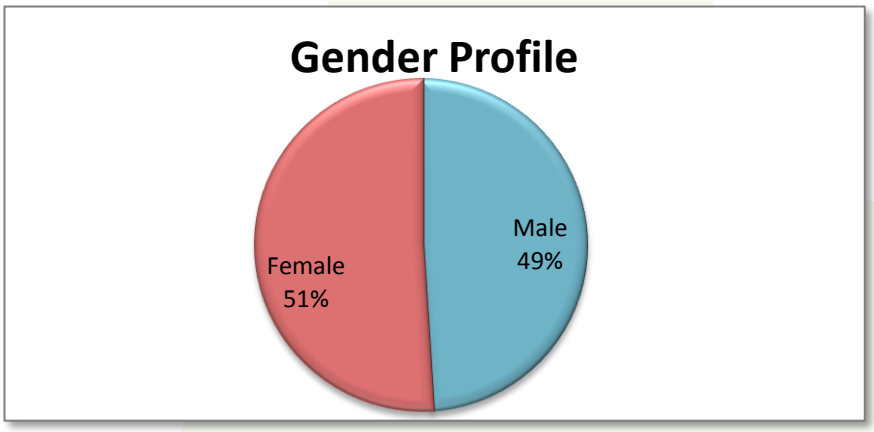

FIGURE 7: GENDER STATISTICS OF NALEDI LOCAL MUNICIPALITY

ETHNICITY AND LANGUAGE

It was found that the largest ethnic group living in the Naledi Local Municipality area was Africans, making up approximately 74% of the population group. The second largest ethnic group in Naledi is mixed race with 13.4%. The smallest ethnic group making part of the population within the local municipality area is Indian Asians with only 1.1%[33].

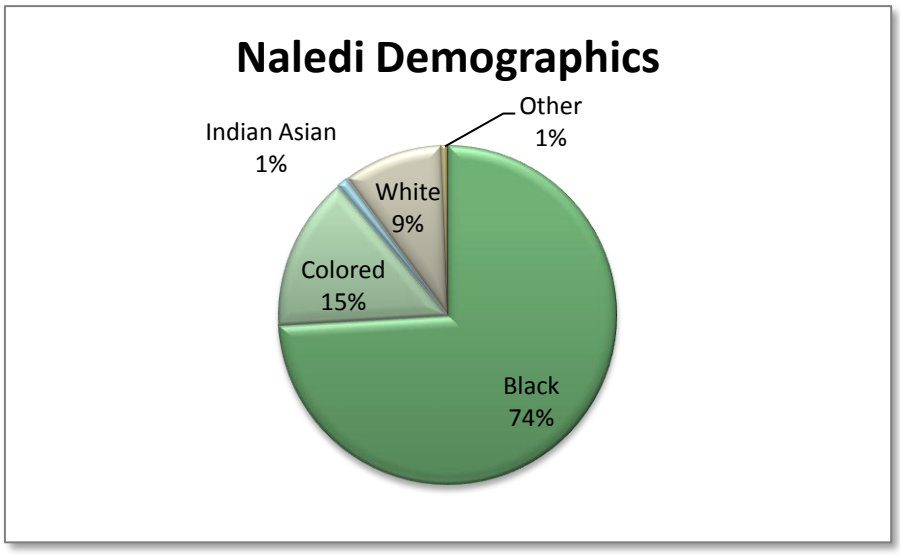

FIGURE 8: RACE DISTRIBUTION IN THE NALEDI LOCAL MUNICIPALITY

EDUCATION

The information provided indicated educational facilities (primary, secondary, intermediate and combined schools) throughout Naledi Local Municipality. This information indicated that educational facilities are mostly located in Naledi and Huhudi. However, most of the settlements have access to educational facilities. Education facilities in the municipality consist of the following:

- Sixteen (16) Primary Schools
- One (1) Combined School
- One (1) Intermediate School
- Fourteen (14) Secondary Schools

[33] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.

A large section of the population is composed of present and former farm labors hence the low levels of education especially among those from the age of +45 years. Illiteracy creates a significant problem and impact on the local economic development.16.60% of the population has no schooling followed by 22.2% with Grade 12/Matric education and only 9.10% have attained higher education. This reflects a moderate education level[34].

There is a significant proportion of the population, especially in the farms and townships areas where the population only has a primary level of education. In addition, the majority of the population of the local area (approximately 25% - 45%) did complete their secondary education. The highest level of households with tertiary education qualifications is concentrated within the three main towns. However, due to limited job opportunities in the local area few of those with tertiary education qualifications remain in the Municipality[35].

Several other factors influence the level of skills and education within the municipality, the:

- Out migration of skilled workers in search of jobs outside the Municipality / Province
- Out migration of students to universities who do not return to the area once their degrees are attained.
- Increasing death rate as a consequence of the spread of HIV/AIDS.
- Declining employment opportunities resulting in unskilled and semi-skilled to move to larger urban centers outside the Municipality/and or Province.

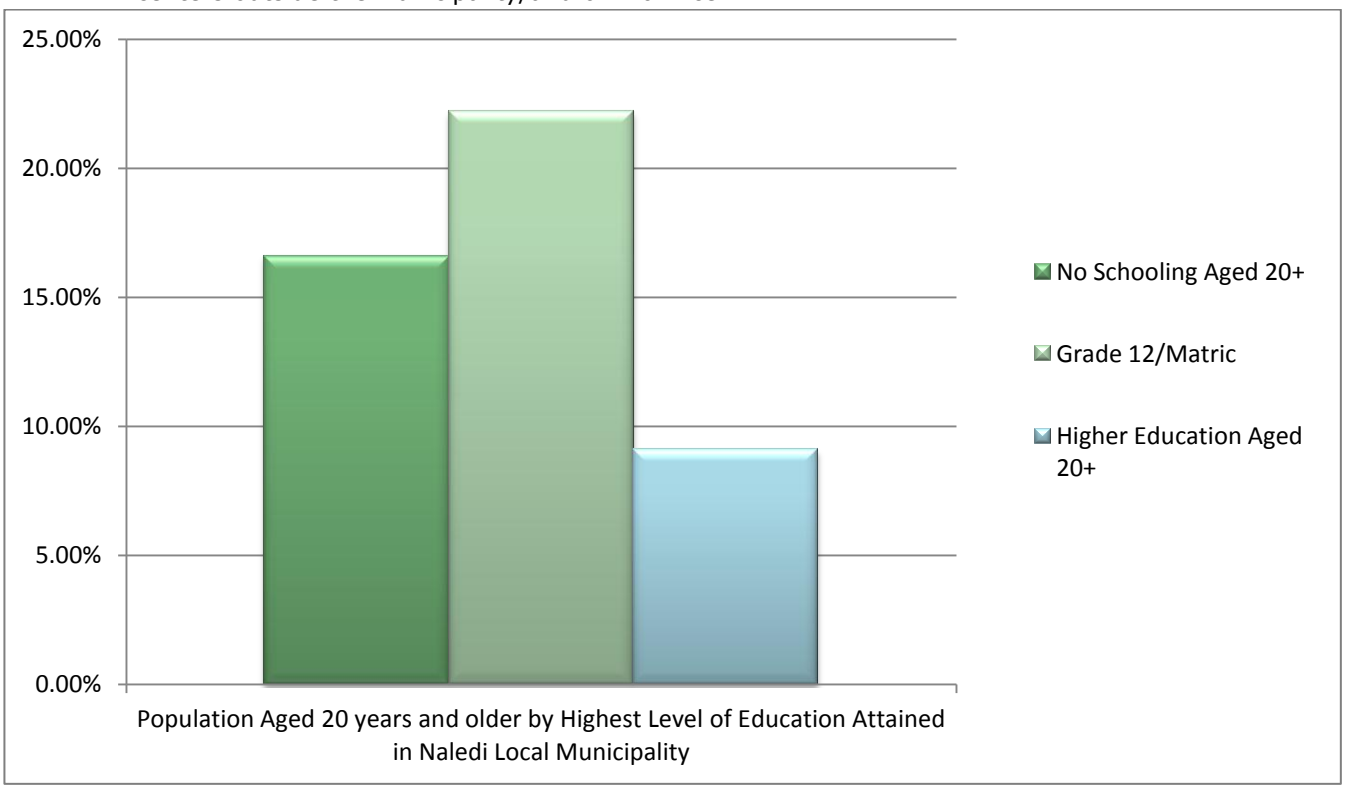

Figure 8: Population aged 20 years and older by highest level of education within the Naledi Local Municipal area.

[34] Statistics South Africa. (2011). *Population*. Retrieved October 22, 2013, from Statistics South Africa: http://beta2.statssa.gov.za/

[35] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.

HEALTH

The provincial headquarters department of health is in Mmabatho North West Province and the regional office is based in Vryburg and one sub region in Taung. The provision of health services is the function of the provincial government (Dr Ruth S Mompati District Municipality, 2012)[36].

The information provides indication on health facilities (hospital, clinic and community health centers) throughout Naledi Local Municipality. This information indicates that health care facilities are mostly located at Vryburg and Huhudi, whilst most of the settlements have access to health facilities (Maxim Planning Solutions (Pty) Ltd, 2012)[37].

Health facilities in the municipality consist of the following:

- Two hospitals
- Three Clinics
- One Community Health Centers
- Three mobile services

COMMUNICABLE DISEASES (HIV/AIDS, TB)

According to the 2008 *South African national HIV prevalence, incidence, behavior and communication survey* (HSRC survey) reports that HIV prevalence in people aged 2+ years in North West is 11.3% (95% CI: 9.1, 14.0). In people aged 15-49 years, the estimate of HIV prevalence rises to 17.7% (95% CI: 13.9, 22.3). This estimate is comparable to those obtained in 2005 (18.0%, 95% CI: 13.7, 23.2)[38].

Although research indicates that the North West Province had the highest rate of intergenerational sex when compared to other provinces, which increases individuals' chances to be infected, statistics from 2008 indicated that the HIV prevalence was the lowest within the Dr RSM DM (28.1%) (Johnson, Kincaid, Laurence, Chikwava, Delate, & Mahlasela, 2009)[39]. The proportion of ANC clients tested for HIV increased to 94% in 2007/08. The nevirapine uptake in HIV+ve ANC clients increased slightly in 2007/08[40].

Within the Dr RSM DM the TB cure rate was marginally higher in 2006 (67.4%) than it was in 2003 (66.5%), while the smear conversion rate decreased consistently from 59.1% in 2004 to 44.3% in 2007. Urgent managerial attention is required to improve the TB control programme in this district, particularly since annual TB incidence is fairly high at 356 new smear positive cases per 100 000 members of the population[41].

The stillbirth rates and peri-natal mortality rates were close to the national averages, at 22.8 and 33 per 1000 deliveries, respectively, in 2007/08 and have more than halved since 2000/01.[42]

[36] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[37] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.
[38] Johnson, S., Kincaid, L., Laurence, S., Chikwava, F., Delate, R., & Mahlasela, L. (2009). Second National HIV Communication Survey 2009: Findings from Eastern Cape Province. Pretoria: JHHESA.
[39] Johnson, S., Kincaid, L., Laurence, S., Chikwava, F., Delate, R., & Mahlasela, L. (2009). Second National HIV Communication Survey 2009: Findings from Eastern Cape Province. Pretoria: JHHESA.
[40] Monticelli, F. Section B: District and Province Profiles.
[41] Monticelli, F. *Section B: District and Province Profiles.*
[42] Monticelli, F. *Section B: District and Province Profiles.*

SOCIAL PROBLEMS AND VULNERABILITY

According to the Census 2011 Municipal Report the dependency ratio of groups considered vulnerable (Individuals 14 years of age and younger and individuals 65 years and older) has increased within the Naledi Local Municipal Area while only the dependency ratio of individuals 65 years and older has experienced an increase in the Dr RSM DM Area[43].

There was an increase in Individuals 14 years of age and younger group from 18 184 to 20 683 from 2001 to 2011. The group of individuals 65 years and older within the area of Naledi Local Municipality increased from 2 552 in 2001 to 3 358 in 2011. The Dr RSM DM Area group of individuals 65 years and older increase from 24 189 in 2001 to 29 861 in 2011[44].

MAJOR ECONOMIC ACTIVITIES AND SOURCES OF EMPLOYMENT

The economy of the Dr RSM DM is low-keyed, with the exception of the agricultural sector in the Naledi and Mamusa Local Municipal areas. The Naledi Local Municipal area dominates the economy in the majority of the economic sector and activities[45].

The largest sources of employment within the Naledi LM are Agriculture followed by Community Services and Wholesale and retail Trade. The figure below illustrates the key sectors of employment.

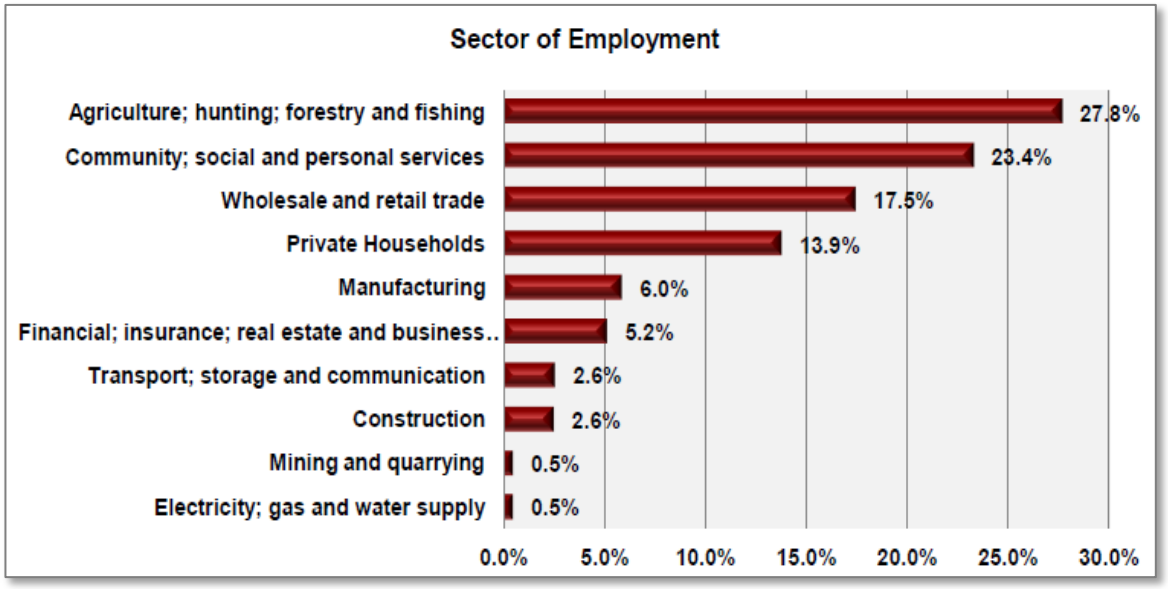

FIGURE 9: SECTORS OF EMPLOYMENT IN THE NALEDI LOCAL MUNICIPALITY

Based on Census 2001 data, only 19% of the population in the Dr RSM DM is employed of which most of them receive a monthly income of less than R1 600. A large portion of the population has either had no schooling or has just primary education. A small portion (18%) of the population has secondary education with even a smaller portion of the population (1%) has tertiary education[46].

[43] Statistics South Africa. (2012). *Census 2011 Municipal Report - North West.* Pretoria: Statistics South Africa
[44] Statistics South Africa. (2012). *Census 2011 Municipal Report - North West.* Pretoria: Statistics South Africa
[45] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[46] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

The unemployment rate in Naledi is estimated at 11.9% and the total of persons who are not economically active is estimated at 25.6%. From this analysis, it is the evident that this socio-economic plight experienced by the communities of Naledi people, has a negative effect on the overall financial sustainability of the municipality as more and more people are unable to pay for their municipal services and thus have to rely on subsidized municipal services[47].

According to Statistics South Africa's Community Survey: 2007, the unemployment rate in Naledi Local Municipality is as follows:

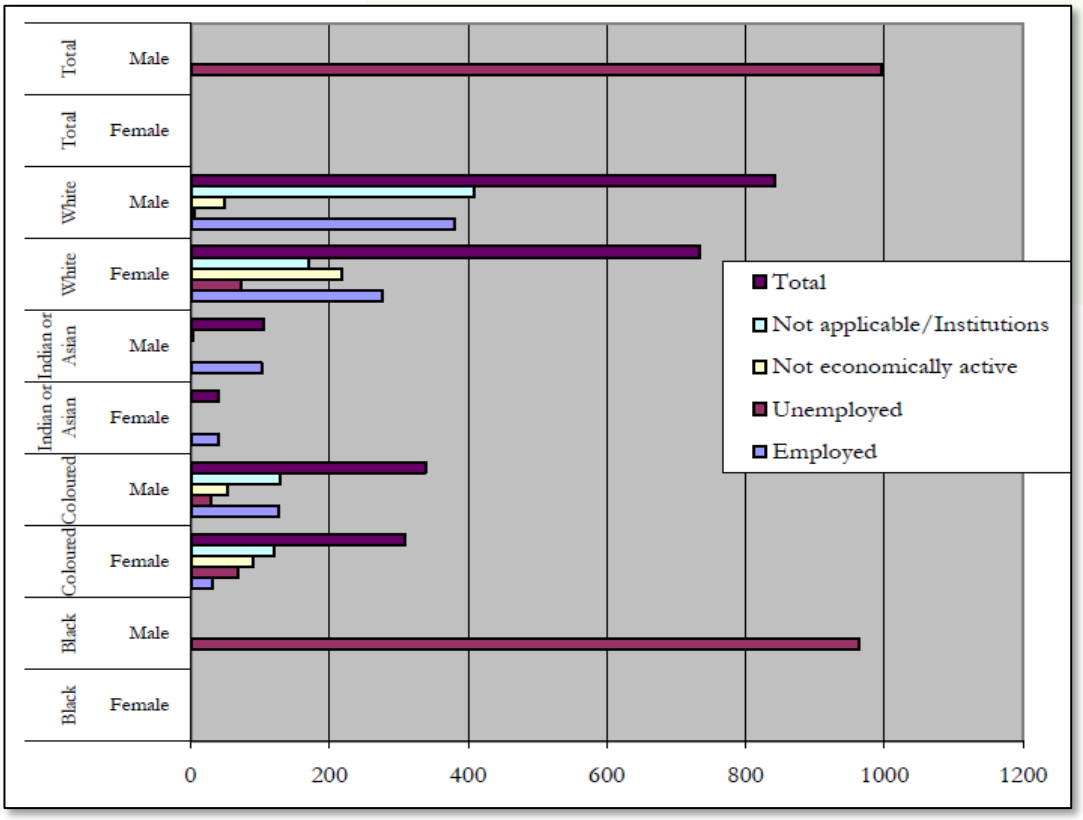

FIGURE 10: UNEMPLOYMENT RATES AMONG THE DIFFERENT RACE GROUPS IN NALEDI LOCAL MUNICIPALITY

From the above presentation, it is evident that black male constitute the highest proportion of employed people, followed by white male and white female. In general, females represents the lowest proportion of employed people in the municipality which will suggest that specific focus and attention should be paid towards developing ways and means to get more and more women employed and participating in the main stream economy[48].

[47] Naledi Local Municpality. (2010/2011). *Naledi Local Municipality IDP & Budget.* Vryburg: Naledi Local Municipality.
[48] Naledi Local Municpality. (2010/2011). *Naledi Local Municipality IDP & Budget.* Vryburg: Naledi Local Municipality.

KEY SECTORS OF DR RUTH S MOMPATI DISTRICT MUNICIPALITY

Taking the gross domestic products of Dr. RSM DM into consideration, it is depended highly on agriculture and hunting, mining and government sectors for growth purpose. The major economic activities in the Dr RSM DM are livestock farming, manufacturing, retail trade and financial institutions[49].

Even within the global economic slowdown, the district economy has shown a growth level of 1.7% of the GDP between1996-2009. Contribution to the total economic growth was within the following sectors: agriculture (-01%), mining (0.0%), manufacturing (0.1%), electricity (0.0%), construction (0.1%), trade (0.0%), transport (0.2%), finance (0.5%), community services (0.6%) and the total industries contributed 1.5% of the total GDP.[50]

OTHER SECTORS

The figure below shows the main sectors of Dr. RSM DM. The sectors which are significant contributors are agriculture and fishing, education, public administration, retail, finance, transport and the least is metal products, collection, purification and distribution of water, hotels and restaurants.[51]

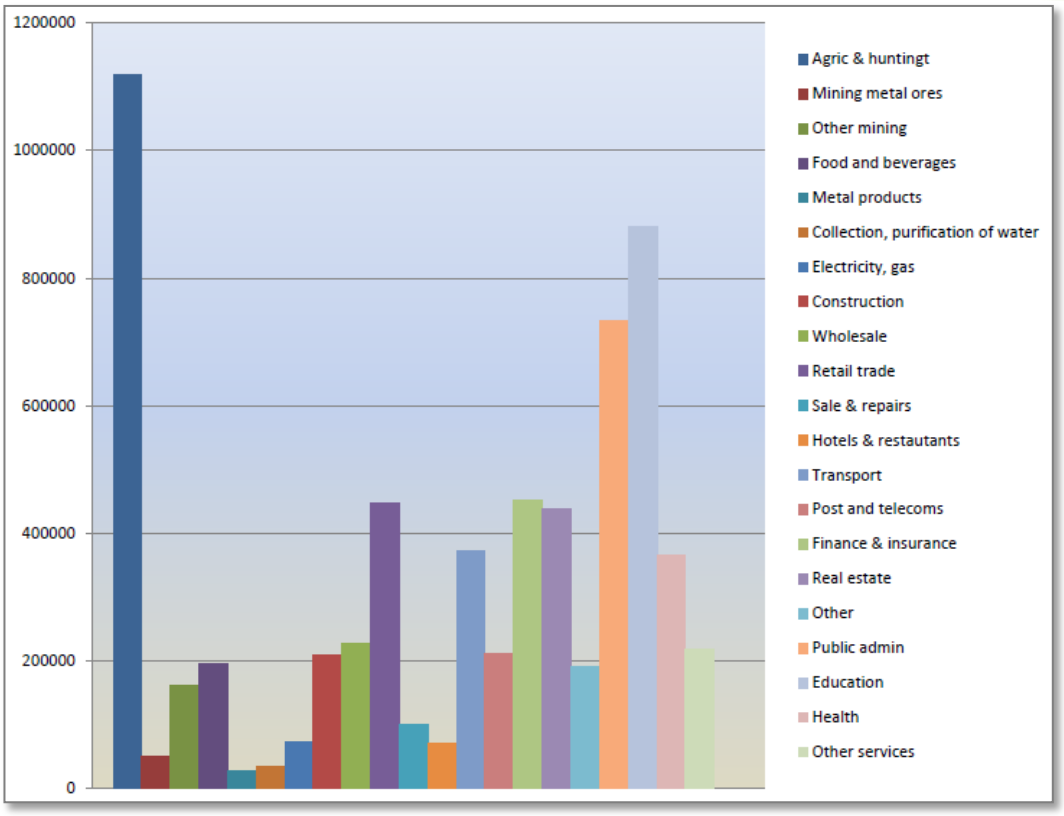

FIGURE 11: THE MAIN SECTORS IN THE DR RUTH S MOMPATI DISTRICT MUNICIPALITY

[49] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[50] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[51] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

HOUSEHOLDS INCOMES

The low functional literacy levels and low employment figures in the informal sector and the high levels of unemployment amongst African and colored race group means that income levels are low in Dr. RSM DM. The table below illustrates the number of households by income category for the Dr. RSM DM.[52]

Annual Income	Total	African	White	Coloureds	Asians
0-2400	435	418	0	17	0
2400-6000	1 269	1252	4	14	0
6000-12000	12 937	12393	13	521	2
12000-18000	15 368	14920	4	427	9
18000-30000	19 875	19594	9	237	20
30000-42000	16 911	16486	29	360	20
42000-54000	11 827	11463	43	297	19
54000-72000	9 636	9149	69	364	17
72000-96000	7 058	6371	350	290	19
96000-132000	5 432	4480	685	251	27
132000-192000	4 449	3325	883	197	29
192000-360000	5 071	3197	1630	166	13
360000-600000	2 330	1250	1003	49	4
600000-1200000	1 109	475	602	18	2
1200000-2400000	291	119	167	3	0
2400000+	59	27	31	0	0
Total	114 059	104922	5522	3211	180

The income distribution of individuals follows much the same pattern across the province, with the majority of people not earning a formal income at all, or falling within the lower income brackets. Accordingly, 7 % of people with income earning potential in Naledi earn no income, 10 % earned between R1 and R4 800 per month[53]. The table below illustrates the household incomes per month for the Naledi Local Municipality area.

Naledi Local Municipality	Monthly Income Categories						
	None	R1 – 4800	R4801 – 9600	R9601 - 19200	R19 201– 38400	> R38401	Response not given
	714	798	970	2 200	1 895	1479	217
%	51.89	11.63	4.09	11.35	4.13	11.80	2.70

[52] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[53] Statistics South Africa. (2009). *Community Survey 2007: Basic Results - North West.* Pretoria: Statistics South Africa

BULK SERVICES AND INFRASTRUCTURE

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

Transportation in the District Municipal area is insufficient. Though roads are part of the provincial responsibility, the municipality has a role to play in supporting the provincial government. Most of the roads are in a bad state and this has an impact in service delivery issues including economic development. There will always be delay in provision of service should roads deteriorate to unacceptable levels.[54]

According to current survey, 70 532 households (62%) of the households have access to formal refuse removal services. These households receive municipal refuse removal services weekly. 33 085 of these households receive municipal refuse removal services weekly. This number is above average suggesting that Dr. RSM DM is delivering on refuse removal. 3 531 households (3%) receive refuse removal less often than weekly by authority. 3 971 households (6%) use own dumping for refuse removal.144 households receive services from community members for removal. 36 households (6%) receive no refuse removal services.[55]

NALEDI LOCAL MUNICIPALITY

The following service delivery backlogs for major categories of services as outlined hereunder, measured on the basis of number of households:

Service Delivery Backlog				Relative Weight	
Ward	Housing	Water	Sanitation		
1	271	271	30		
2	727	727	382	Housing	40%
3	386	386	283	Water	20%
4	866	866	187	Sanitation	40%
Total	2250	2250	2890	Total	100%

WATER SUPPLY

Dr RSM DM is the Water Authority and Naledi Local Municipality is the Water Service Provider. According to the Taung/Naledi Bulk Water Supply Scheme, the only area in Naledi that is supplied with surface water is Vryburg town. Vryburg relies on groundwater for ±50% of its primary water demand while the rest is supplied from the Pudimoe Treatment Works via the newly upgraded Pudimoe-Vryburg pipeline. The capacity of this pipe is sufficient to carry the total water demand for Vryburg. The Pudimoe Water Supply Scheme utilizes Vaal River water from the Vaalharts Irrigation Canal as water source.[56]

A total 90 366 households (90.3% of the households) in the Dr RSM DM Area have access to acceptable levels of water services. Estimated 20 916 households (20.9% of the households) use piped water inside the dwelling. 20 315 households (20.3% of the households) use water inside the yard. A total 49 136 households (or 49.1% households) use piped water from access point outside the yard. A total 9 708 households (9.7% households) don't have access to acceptable levels of water services.

According to Naledi Local Municipality's latest Spatial Development Framework the water capacity in the area is as follows:

[54] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[55] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[56] Maxim Planning Solutions (Pty) Ltd. (2012). Naledi Local Municipality Spatial Development Framework. Vryburg: Maxim Planning Solutions (Pty) Ltd.

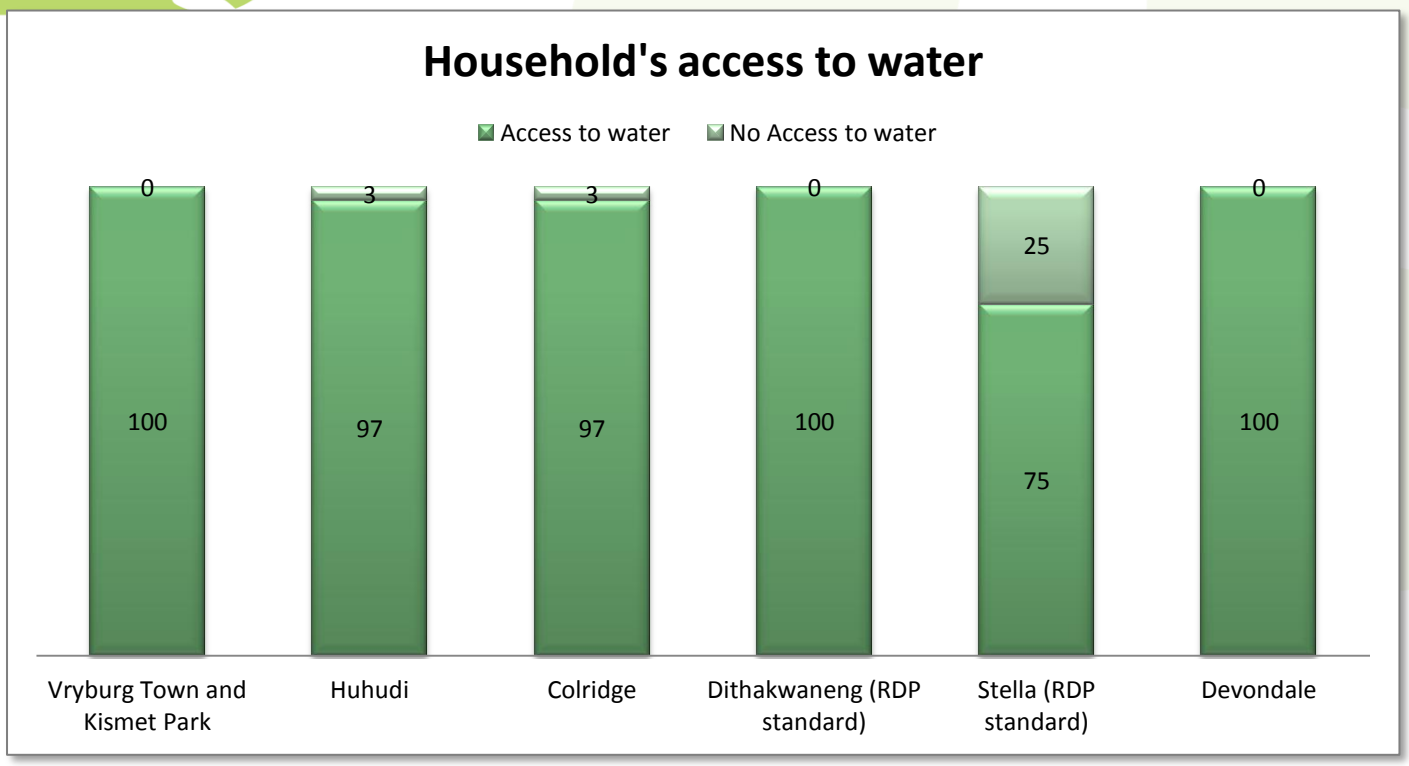

FIGURE 12: HOUSEHOLD'S IN NALEDI LOCAL MUNICIPALITY'S ACCESS TO WATER

SANITATION

A number of the households 33 325 households or 33.3% of the households in the Dr RSM DM Area have access to acceptable levels of sanitation services. A small number of the households, 66 749 or 66.7% of the households in the Dr RSM DM Area, however, are in need of acceptable levels of sanitation services. 31 323 households (31.3% of the households) use flushing toilets connected to sewerage.[57]

About 2002 households (2.0% households) use flush toilet (with septic tank), whilst 1 702 households (1.7% households) use dry toilet facility. An estimated 15 812 households (15.8% of the households) use chemical toilets. Total 30 923 households (30.9% households) use a pit latrine with ventilation (VIP). 100 households (0.1% households) use a pit latrine without ventilation. Lastly, 2002 households (2.0% households) use a bucket latrine. 6 205 households (16.2% of the households) are not provided with any sanitation.[58]

POWER SUPPLY

A total 81 759 of households or 81.7% households in the Dr RSM DM Area use electricity for lighting. An estimated 100 households or 0.1% households in Dr RSM DM use gas for lighting. About 2001 households or 2.0% household use paraffin for lighting.

A number of the 15 811 households or 15.8% of the households use candles. About 100 households (0.1% households) in the Dr RSM DM Area use solar energy for lighting. About 200 households or 0.2% household uses other sources of energy such as wood, coal etc for lighting.[59]

[57] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[58] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.
[59] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

The following areas according to percentages within Naledi Local Municipality's jurisdiction have access to electricity:

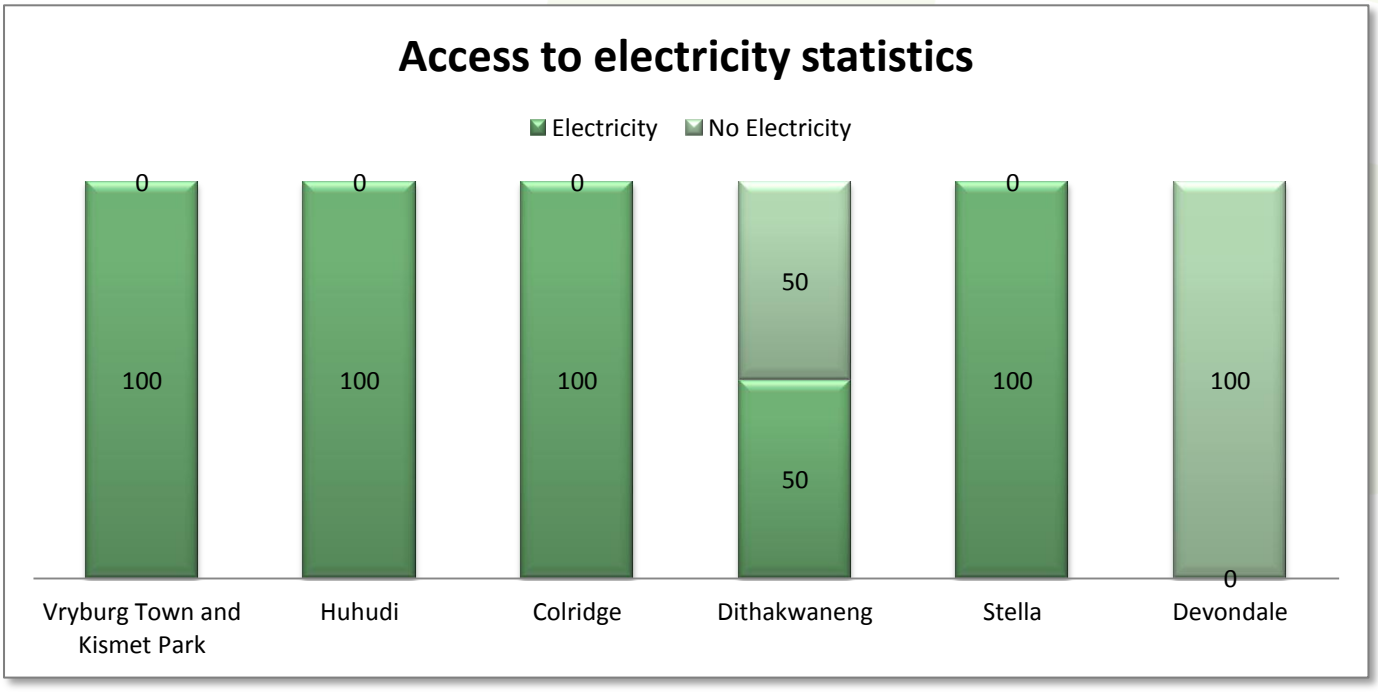

FIGURE 13: ACCESS TO ELECTRICITY STATISTICS OF THE INHABITANTS OF THE NALEDI LOCAL MUNICIPALITY

TRANSPORT, ROADS AND RAIL

There are two main roads in Naledi LM and that is N18 linking Mahikeng to Warrenton (passing through Stella, Vryburg, and Taung) and the N14 highway linking Gauteng to Upington (passing through Vryburg). Vryburg forms the centre of the ox-wheel in relation to the major roads. The most heavily trafficked routes include the N14 from Vryburg to Upington, and the N18 from Vryburg to Warrenton.[60]

The main railway line includes the Mahikeng to Warrington line which passes through Vryburg and Taung. No rail networks exist in the northern two thirds of the district, i.e. north-west of Vryburg. The rail network is utilized for both public and freight transport purposes. The public transport demand on this section of the railway line consists of exclusively long-distance passengers.[61]

[60] Maxim Planning Solutions (Pty) Ltd. (2012). Naledi Local Municipality Spatial Development Framework. Vryburg: Maxim Planning Solutions (Pty) Ltd.
[61] Maxim Planning Solutions (Pty) Ltd. (2012). Naledi Local Municipality Spatial Development Framework. Vryburg: Maxim Planning Solutions (Pty) Ltd.

LAND TENURE AND REFORM

Land reform in South Africa encompasses three primary segments namely land restitution, tenure reform and land redistribution. The redistribution segment has different components which include:

- Agricultural Development: to make land available to people for agricultural purposes.
- Settlement: to provide people land for settlement purposes.
- Non-agricultural enterprises: to provide people land for non-agricultural enterprises, for example eco-tourism projects.

LRAD has two distinct parts. Firstly, LRAD deals with the transfer of agricultural land to specific individuals or groups. Secondly, LRAD deals with commonage projects, which aim to improve people with access to municipal and tribal land, primarily for grazing purposes.

The strategic objectives of the sub-programmes include:

- Contributing to the redistribution of 30% of the countries agricultural land over 15 years
- Improving nutrition and incomes of the rural poor who want to farm on any scale
- De-congesting over-crowded former homeland areas
- Expanding opportunities for women and young people who stay in rural areas

In order to align Land Reform Initiatives the Department of Rural Development and Land Reform embarked on a series of Area Based Plans (ABP) to align Land Reform Projects with the SDF and other sector plans. The agricultural sector in Naledi is dominated by private land where the focus is on the production of cattle. In order to expand farming enterprises, land is required.

Land reform projects should target prime agricultural land if the intention is to benefit a number of people. Land reform projects should form part of existing nodal development and be close to selected rural nodes in order to improve the accessibility of beneficiaries to higher order of social and economic infrastructure and facilities.

Therefore, the SDF for Naledi Local Municipality needs to advocate the increased availability of land. The SDF should identify opportunities for Land Reform especially in the agriculture and eco-tourism fields where possible. The lengthy land claims process constrains development in Naledi Local Municipality with land not being able to be developed until the claims has been settled and therefore Land Reform elements have to materialize in this regard.[62]

The Land Use Management Bill processed and enact in order for an effective Land Use Management System to be in place. The Naledi, Lekwa-Teemane, Greater Taung and Mamusa Local Municipalities have Town Planning Schemes which are outdated and do not address certain issues, i.e. rural land use management, and hence are deemed ineffective. The district plans is to have updated LUMS for all local municipalities during the third or fourth quarter of the 2012/2013 financial year.[63]

[62] Maxim Planning Solutions (Pty) Ltd. (2012). Naledi Local Municipality Spatial Development Framework. Vryburg: Maxim Planning Solutions (Pty) Ltd.
[63] Dr Ruth S Mompati District Municipality. (2012). Dr RSM DM Integrated Development Plan 2012-2017. Vryburg: Dr Ruth S Mompati District Municipality.

3. PROJECT DESCRIPTION

3.1. INTRODUCTION

3.1.1. PROPOSED PROJECT

The Dr. RSM DM intends to construct a new WWTW for Vryburg. A technical assessment of the existing Works was then done and it was determined that the existing Works cannot be upgraded and should be re-built elsewhere. A feasibility study for the viability of a possible new works was then conducted based on the Department of Water Affairs and Forestry (DWAF) guideline format and policies.

The Vryburg Wastewater Treatment Works will be designed for combined domestic and industrial wastewater. The Basis of Design (BoD) has a planning horizon of 20 years, up to 2029. The BoD is based on the current WWTW sampling conducted during 2009, as well as a recent sampling program (one week) and flow measurement program conducted during May/June of 2013. This sample is extrapolated for planning using declared and actual demographics and population growth of Vryburg.

3.1.2. PROJECT LOCATION

Initially 3 sites were looked into where after it was increased to 5 sites. This was done to ensure all possible options are investigated and the best decision made. Each of the 5 sites were inspected by specialists as well as rated according to different measures. The suitable waste water treatment plant site will pose minimal risk to the environment, public health & safety and private & public properties which are associated with an acceptable cost of project development, operation and closure and that comply with legal and regulatory requirements.

For the site selection process, the following were assumed:

- The ultimate capacity of the waste water treatment plant will be 16 Mℓ/day and its life will extend beyond 20 years.
- The waste water treatment plant site will include the plant components, offices and treated water storage containers.
- The initial footprint requirements for a screening level evaluation were defined as 500 m x 500 m.
- The buffer area of 500 meters from the WWTW to any residential development should be maintained for environmental, health, safety and possible expansion purposes.
- The Sewer outlet should be constructed by means of gravity feed to the WWTW. Pumping is seen as a high maintenance, expensive and technically challenging option.

The alternative sites were assessed according to impacts in terms of Heritage; Ecological; Ground water; Surface Water; Biophysical; Air Quality; Technical; Financial, Financial, Land Administration and Legal aspects. The following table shows the different ratings for the above mentioned categories:

TABLE 2: SUMMARY OF MAJOR INFLUENCES CONSIDERED TO SELECT A SUITABLE SITE

Alternative	Heritage	Ecological	Surface Water	Ground Water	Air Quality	Technical	Financial (Operational)	Land Administration (Operational)	Legal
Site 1	No significant impact	No significant impact	Moderate impact for all alternatives	Limited diffferentiation with close proximity of sites	Negative	Negative	Negative	Positive	Permitting requirements remain the same
Site 2	No significant impact	No significant impact	Moderate impact for all alternatives	Limited diffferentiation with close proximity of sites	Negative	Negative	Negative	Negative	Permitting requirements remain the same
Site 3	No significant impact	Low	Moderate impact for all alternatives	Limited diffferentiation with close proximity of sites	Negative	Moderate	Moderate	Negative	Permitting requirements remain the same
Site 4	No significant impact	Moderate	Moderate impact for all alternatives	Limited diffferentiation with close proximity of sites	Moderate	Positive	Positive	Positive	Permitting requirements remain the same
Site 5	No significant impact	Moderate	Moderate impact for all alternatives	Limited diffferentiation with close proximity of sites	Moderate	Positive	Positive	Positive	Permitting requirements remain the same

After the table above were followed, a final site for the project was been chosen. The site is situated between site 4 and site 5 (see map below).

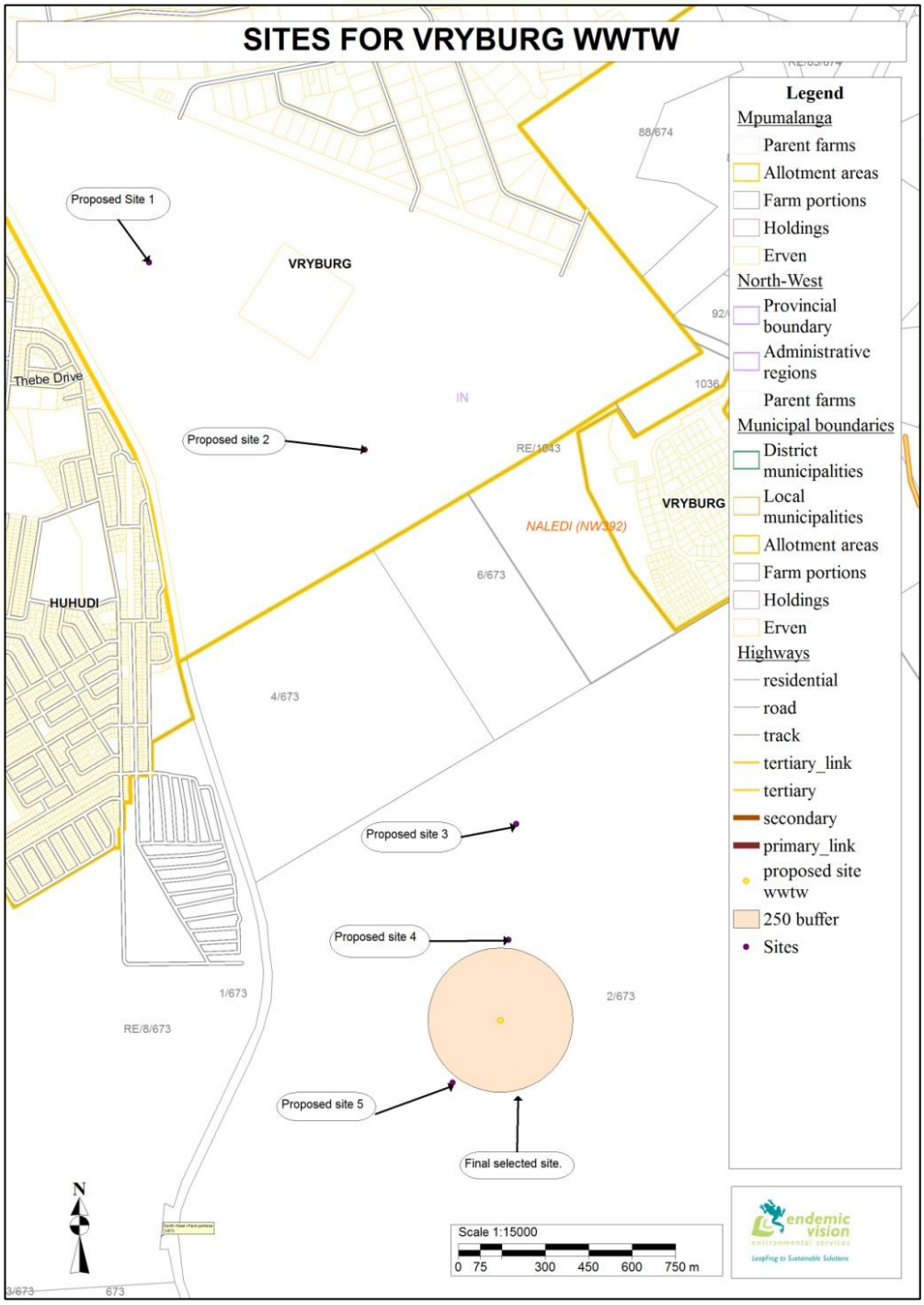

FIGURE 14: PROPOSED SITES FOR THE WASTE WATER TREATMENT WORKS AND THE FINAL CHOSEN SITE

3.2. MOTIVATION FOR NEW WWTW

The present situation impacting the town of Vryburg in a drastic manner is that the existing WWTW can no longer accommodate the sewage flow and load. Various new housing developments are in progress and form part of a much bigger housing initiative for Vryburg and are planned in a phased manner.

Phase 1 involves a low-cost housing development where 1 500 units are being built and will be completed by August 2009. This additional load will then impact the already over-loaded treatment works. **Phase 2** of the housing developments was approved during March 2009 and this will be completed by 2011 when an additional 3 000 housing units will be connected to the sewer network of Vryburg. The **Phase 3** development will accommodate another approximate 2 000 housing units that will be completed by 2012. A portion of Phase 3 involves approximately 850 housing units that will not be able to gravitate to the existing treatment works.

An aggravating factor is that there is limited scope for upgrading of the existing Works as the site has very little expansion options available. Towards the north-east the Bles Spruit borders the site, whilst to the south and west the Huhudi Township has grown right up against the Works. This expansion of Huhudi is such that the Works does not comply with health regulations where the minimum clearance to households has for some time now been encroached.

The design flows are summarized in the table below. A per capita unit flow rate of 120 liter per capita per day was calculated based on the 2007 population data, water usage and recorded flows at the existing WWTW. The 2013 flows recorded at the existing waste water treatment works were used to determine the diurnal flow pattern and peak flows, as well as the expected per capita loading rates. The flow rates were adjusted to reflect unserviced areas in the Municipal District where future waterborne sanitation will be installed that will report to the new WWTW, as well as the impact of blocked sewage drains and pipelines as indicated by the Municipality.

The funding application submitted to Department of Water Affairs indicated the need for a 16 Ml/d WWTW to be constructed. The plant flows are summarized in Table 3.

TABLE 3: POPULATION AND WASTEWATER FLOWS

Design for 2029			
Contributor	Number of People 2007	Design Flow (m3/d)	Peak factor
Dr Ruth S Mompati District Municipality	75 410	16 000	
Average Dry Weather Flow (ADWF)		16 000 m^3/day	
Peak Daily Dry Weather Flow (PDDWF)*		30 400 m^3/day	1.9
Peak Wet Weather Flow (PWWF)		43 500 m^3/day	2.7

Flow above 30 400 m³ per day will be diverted to the chlorine contact channel prior to discharge to the constructed wetlands.

3.3. PLANNING & DESIGN

After thorough research regarding the design of the treatment plant, it was decided that the Biological Nutrient Removal (BNR) Activated Sludge Process would be used.

The selection of this process also went through an assessment of alternatives. The alternatives comprised of four options:

- Option 1: Anaerobic ponds and trickling filters
- Option 2: Extended aeration
- Option 3: Extended aeration BNR with fermentation – Activated sludge process
- Option 4: Conventional BNR – Activated Sludge Process

These options were then evaluated by the following measures by using four categories (positive, negative, marginal, and not significant):

- Treatment process (main stream)
  - Robust performance
  - Reliability
  - Redundancy
  - Operation of plant
- Waste streams disposal
  - Screenings
  - Grid
  - Sludge
- Air emissions
- Environmental
  - Transport of chemicals
  - Health & safety risks
  - Treated water quality
  - Energy consumption
  - Potential for renewable energy
  - Overall carbon footprint
- Financial
  - Capital costs
  - Operational costs

The process shown below utilizes the same preliminary treatment process from where the raw screened and de-gritted sewage flows to the BNR reactor. The reactor discharges to the secondary clarifiers. The overflow from the clarifiers flows to the chlorine contact channel, followed by the polishing wetlands and discharges to the environment. The RAS from the secondary clarifiers is recycled to the inlet of the BNR reactors. The WAS is wasted directly from the BNR reactors to the WAS thickener. The thickened sludge is dewatered and dried on sludge drying beds prior to disposal and the overflow or filtrate returned to the BNR reactor inlet.

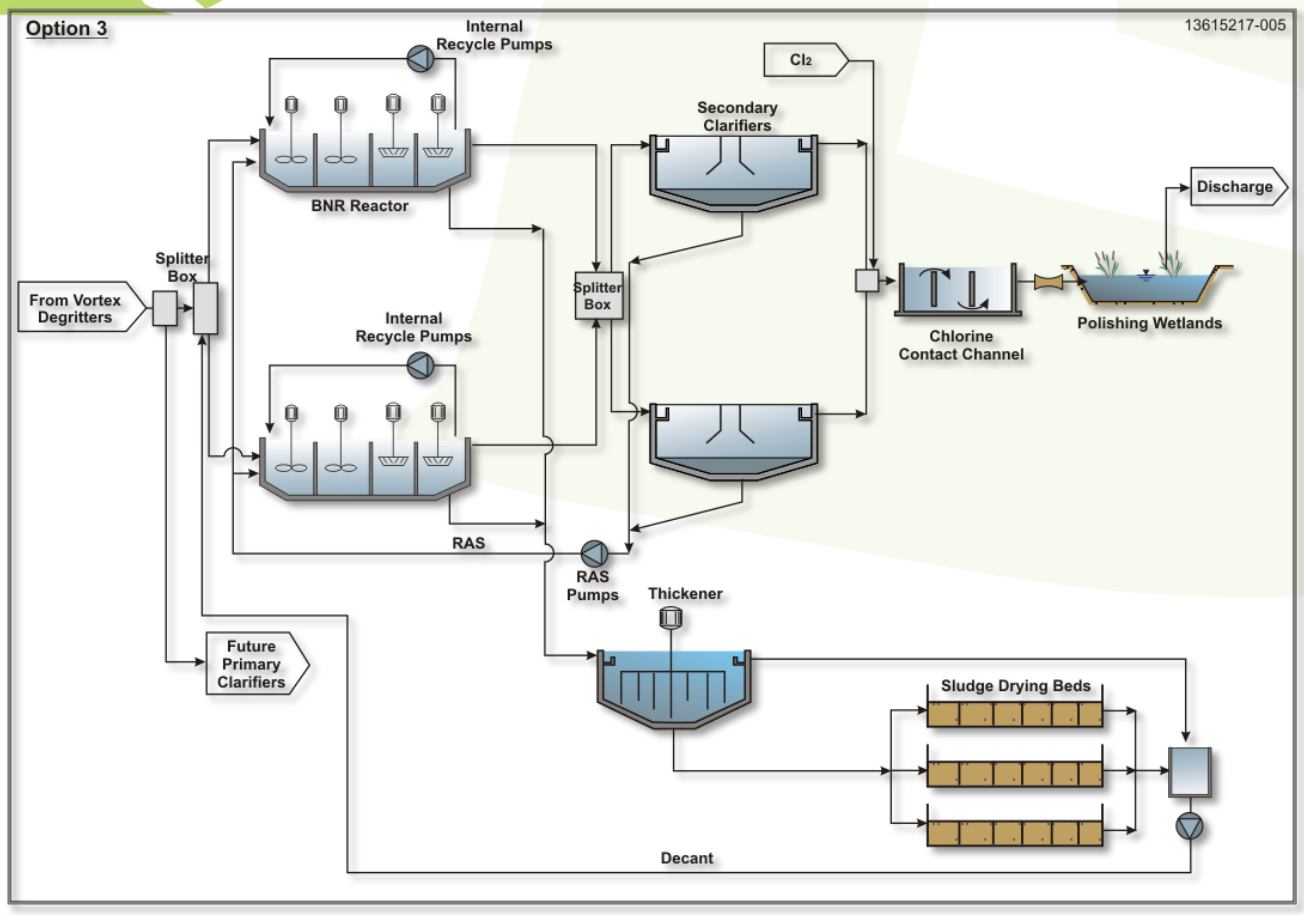

FIGURE 15: BNR ACTIVATED SLUDGE PROCESS

The advantages and disadvantages of this technology are listed below:

ADVANTAGES

- The BNR Activated Sludge Process produces a stable sludge that may be disposed of to a landfill site or utilized as fertilizer and applied to land depending on the legislation concerning the utilization of sewage sludge;
- This technology alternative allows for COD and phosphate removal, as well as nitrification and de-nitrification. The technology configuration meets all discharge standards without the need for additional chemical dosing;
- The BNR reactor configuration allows for some flexibility in operation which improves its response to influent condition changes;
- There is a potential for energy recovery if additional process units are introduced.

DISADVANTAGE

The proposed process has high energy consumption due to the recycle pumping and aeration requirements;

- In comparison to the first two alternatives this process is a more complex system to operate;
- It has higher capital and operational investment requirement than the first two alternatives.

The BNR activated sludge process, without primary sedimentation and sludge digestion, as defined in above was chosen as the preferred process technology configuration. The mainstream process incorporates the following processes, (some future processes are indicated to allow for future plant expansion):

- Preliminary Treatment Process;
  - Screening process;
  - Grit and detritus removal unit;
- Primary sedimentation (future);
- BNR Activated sludge process;
- Secondary clarification;
- Disinfection;
- Polishing treatment and discharge.

The mainstream sludge handling processes incorporate the following, with future processes indicated.

- Primary sludge screening and thickening (future);
- WAS sludge thickening;
- Sludge digestion (future);
- Sludge drying;
- Sludge conditioning (future).

The influent raw wastewater passes an excess storm flow diversion (>PWWF) before entering the inlet works and screening plant. The excess storm flow is diverted through a manual screen to the polishing wetlands, before discharge.

3.3.1. Screening Process

The screening process incorporates the following components:

- Mechanical screens (2) with front raked cleaning mechanisms, with a 12 mm bar spacing.
- Emergency bypass channel with a manual screen and with 50 mm bar spacing.
- Conveyor belt to transport the screenings to the dewatering process.
- Screenings dewatering process with associated wash water system.

The operation of the screens shall be automated based on the following process control approach:

- A maximum difference in water level across the screen (upstream / downstream).
- Timer controlled operation of the screen raking mechanism with a variable time between activation of the raking mechanism and variable duration of operation of the raking mechanism.
- Override for continuous operation of the raking mechanism based on a maximum water level in the inlet channel.
- The activation of the raking mechanism shall be fitted with a manual override with "inching" facility in both the forward and reverse directions.
- The screen control settings must be adjustable on the local PLC.

The mechanical screens, conveyor belt and screenings press is interlocked for optimal operation.

The screenings screw press must have a facility to reverse direction to allow removal of obstructing objects.

3.3.2. Grit/Detritus Removal

The grit detritus removal process would incorporate the following components:

- Grit removal tanks (2) based on the Vortex-type configuration.
- Grit pumps to transfer the grit slurry to the grit classifiers.
- Grit classifiers (2) to separate the clean (low organics) and drained grit/detritus material.

The operation of the grit removal system must be automated based on the following control approach:

- The number of grit tanks in operation is set by opening/closing motorized sluice gates, which allow isolation of individual tanks.
- The grit pumps are operated on a timer basis, which allows running the pumps for an adjustable time interval and for an adjustable rest period.
- The grit classifiers are interlocked with the grit pumps and continue operation for an adjustable period of time after stopping the grit pumps.

The total plant wastewater flow is metered in an open channel Venturi or Parshall-type flow meter.

3.3.3. BNR Activated Sludge Reactors

The BNR Activated Sludge Reactor design is based on the four-stage Johannesburg process configuration, which incorporates:

- Pre-anoxic cell for the de-nitrification of RAS flow.
- Anaerobic cells for the stimulation of enhanced biological Phosphorus removal bacteria.
- Primary anoxic cells for the de-nitrification of the NO_3-N rich recycle from the downstream aerobic cells.
- Aerobic cells for the oxidation of residual COD and ammonia and for the uptake of available PO4-P.

It is proposed to construct two parallel and identical BNR reactor tanks, but with an integrated sludge recycle and wasting system.

The BNR Reactor volume requirements for each 8 Mℓ/day module are detailed in:

TABLE 4 : BNR REACTOR VOLUME REQUIREMENTS FOR EACH 8 Mℓ/DAY MODULE

	Volume (m^3)	**Nominal retention time (hrs)**
Pre-anoxic cell	1 000	3.00
Anaerobic cell	2 500	7.50
Primary anoxic:		
- cell 1	4 375	13.13
- cell 2	4 375	13.13
Aerobic		
- cell 1	4 250	12.75
- cell 2	4 250	12.75
- cell 3	4 250	12.75
A-recycle de-aeration	600	Not on main stream
Total	**25 600**	**75.00**

The aerated mass fraction of the BNR reactor is 51 %.

The mixing requirements of the different unaerated cells are based on an energy density of 5-7 W/m^3. The proposed installed mixer motor sizes are detailed in Table 5:

TABLE 5 : THE PROPOSED INSTALLED MIXER MOTOR SIZES

	Number mixers	**Mixer size (kW/mixer)**
Pre-anoxic	1	11
Anaerobic	2	11
Primary anoxic:		
- Cell 1	2	18.5
- Cell 2	2	18.5
A-recycle de-aeration	1	5.5

The selection of mechanical aerators was based on the 95 percentile flow/load process oxygen requirements. The simulated process oxygen demands are as follows (per 8 Mℓ/day module):

TABLE 6 : THE SIMULATED PROCESS OXYGEN DEMANDS

Process Parameters	**Aerobic Cells**			**Total**
	No. 1	**No. 2**	**No. 3**	
Summer at 50 percentile flows/loads:				
- Respiration rate (mg/ℓ/hr)	21.5	10.1	6.61	-
- Oxygen Demand (kg/day)	2 320	1 095	715	4 130
Summer at 95 percentile flows/loads:				
- Respiration rate (mg/ℓ/hr)	55.3	27.2	19.7	-
- Oxygen Demand (kg/day)	5 975	2 945	2 125	11 045
Process Parameters	**Aerobic Cells**			**Total**
	No. 1	**No. 2**	**No. 3**	
Winter at 50 percentile flows/loads:				
- Respiration rate (mg/ℓ/hr)	13.05	6.77	4.6	-
- Oxygen Demand (kg/day)	1 330	690	470	2 490
Winter at 95 percentile flows/loads:				
- Respiration rate (mg/ℓ/hr)	46.4	33.37	21.25	-
- Oxygen Demand (kg/day)	4 735	3 405	2 170	10 310

The selected mechanical surface aerator sizes are as follows:

TABLE 7 : THE SELECTED MECHANICAL SURFACE AERATOR SIZES

Aerobic	**Number of aerators**	**Power of kW/motor**
Cell 1	2	90
Cell 2	2	65
Cell 3	2	45

Note that the actual energy input will depend on the efficiency of the motor / gearbox assembly, which drives the aerator turbine. The selected aerated sizes cater the 95 percentile load condition.

The BNR process solids inventory was simulated for two seasonal process scenarios.

- Winter @ 15 °C and at SRT = 25 days
- Summer @ 25 °C and at SRT = 25 days

The simulated MLSS concentrations are as follows:

- Winter Operation MLSS = 3 500 mg/ℓ
- Summer Operation MLSS = 3 500 mg/ℓ

The calibrated Biowin process simulation model was utilized to estimate the profile of Nitrogen species concentrations for the different seasons.

Figure 16 shows the simulated summer NH_3-N and NO_3-N concentration profiles in the BNR reactor:

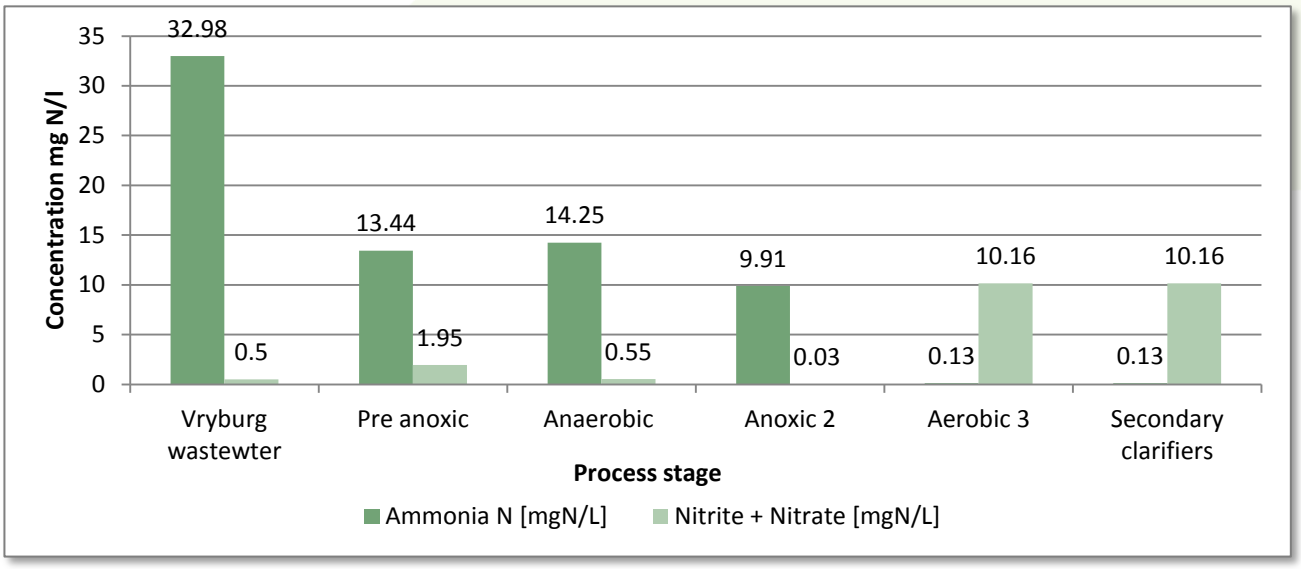

FIGURE 16: STIMULATED SUMMER PROFILE OF NITROGEN SPECIES CONCENTRATIONS (50 PERCENTILE FLOW/LOAD)

Figure 17 shows the simulated winter NH_3-N and NO_3-N concentration profiles in the BNR reactor:

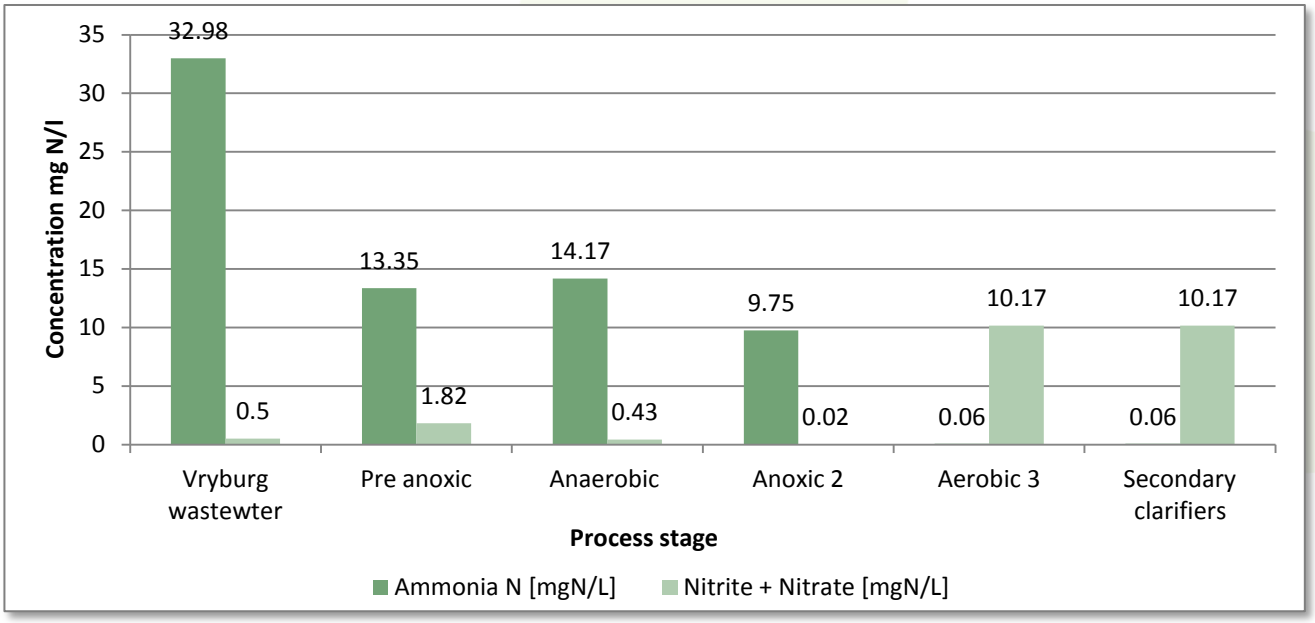

FIGURE 17: STIMULATED WINTER PROFILE OF NITROGEN SPECIES CONCENTRATIONS (50 PERCENTILE FLOW/LOAD)

The BNR Reactor effectively reduces the total N in the system to well below the required 15 mg/ℓ discharge standard as is seen from Figure 16 and Figure 17. The average process efficiency in the removal of total N from the system lies at 69%.

The calibrated Biowin process simulation model was utilized to predict the Phosphate concentration profile for different seasonal operating conditions. The Phosphate removal of the system effectively reduces the concentration to that of below 10 mg/ℓ as with and the average Phosphate removal of the system being 29%.

Two internal recycles have been introduced to the BNR reactor to facilitate increased nutrient removal. The A recycle pumps aerated sewage from the aerated section of the BNR reactor to the anaerobic cell via a de-aeration chamber. The B recycle pumps a flow equal to that of the average daily feed to the BNR Reactor from the anaerobic cells to the pre-anoxic cells. The proposed pumping capacity of the BNR process internal recycle streams are as follows for each 8 Mℓ/day module:

TABLE 8: INTERNAL RECYCLE PUMPS NUMBERS AND CAPACITIES

BNR process internal recycle streams	**Number of pumps**	**Pumping capacity (Mℓ/day per pump)**
A-recycle	2 duty, 1 standby	16.0
B-recycle	2 duty, 1 standby	6.0

Return activated sludge (RAS) is recycled from the secondary clarifier underflow to the primary anoxic compartment where the sludge is not aerated. The RAS is fed into the pre-anoxic zone to facilitate de-nitrification prior to entering the anaerobic zone of the reactor. The RAS recycle rate is equal to or twice that of the plant influent.

Scum from the reactor will be drawn odd on the surface and directed to the Combined Sludge Sump.

The operation of the BNR must be automated with the following control approach:

- All mixers will run at a constant speed;
- Aerators will automatically adjust in accordance with the Dissolved Oxygen concentrations measured in the Reactor;
- Recycles streams A and B flows will be manually switched to run either a single pump or both duty pumps as is decided upon by the plant operator;
- The RAS recycle will automatically adjust proportionally to that of the measured plant inflow.

3.3.4. SECONDARY CLARIFIERS

The secondary clarifiers play a key role in the BNR process, by providing reliable separation of the activated sludge and treated secondary effluent.

The secondary clarifiers are designed based on both hydraulic loading rates and solids loading rates. It is proposed to construct 2 secondary clarifiers, each with a nominal diameter of 23m. The corresponding hydraulic and solids loading rates are summarized in Table 9:

TABLE 9 : SECONDARY CLARIFIER SOLIDS AND HYDRAULIC LOADING RATES

Parameters	**Hydraulic loading rate (m/hour)**	**Nominal Solids loading rate* (kg/m^2 per day)**
Summer:		
- average flow	1.0	105
- peak flow	2.5	360
Winter:		
- average flow	1.0	80
- peak flow	2.5	270

* Nominal SLR excludes the RAS flow associated solids.

The following are the design dimensions for the two secondary clarifiers:

- Number of clarifiers = 2
- Type of clarifier = centre feed with peripheral drive sludge scraper mechanism
- Diameter = 23 m
- Side wall depth = 4 m
- Floor slope = 1 : 6

A solids flux analysis was performed to assess the secondary clarifier solids separation performance for standard operating conditions and a dilute SVI = 135 mℓ/gm. The mass flux curve is shown in Figure 18:

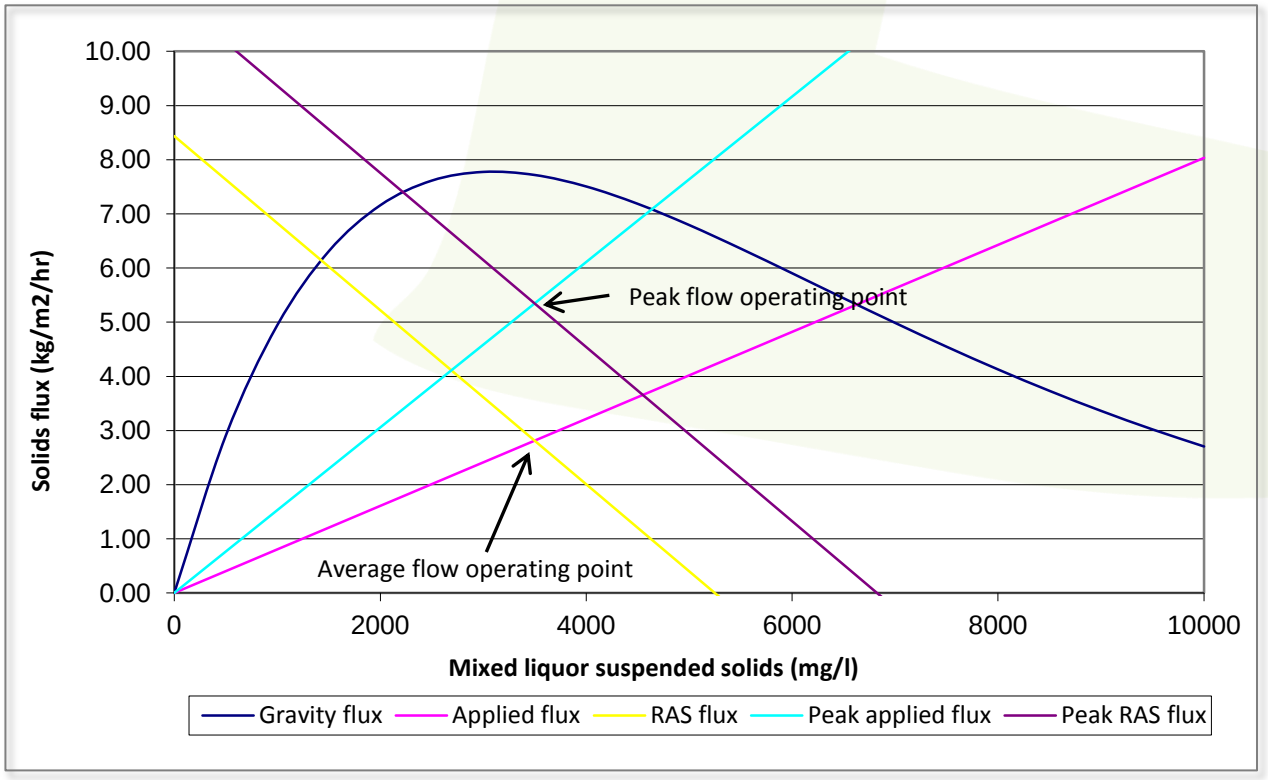

FIGURE 18: MASS FLUX CURVE FOR THE SYSTEM SECONDARY CLARIFIERS

The solids flux analysis shows that for the average design flow conditions and at a limit diluted SVI = 135 mℓ/gm, the secondary clarifiers are operated in a reliable solids separation regime. The peak design flow condition (30.4 Mℓ/day) will push the secondary clarifiers to the limit of reliable operation. It must, however, be kept in mind that the solids flux analysis was performed at a limiting diluted SVI = 135 mℓ/gm. The mixed liquor solids separation properties are typically better than a diluted SVI = 135 mℓ/gm and the secondary clarifiers will, therefore, be operated with an adequate margin of safety.

The Secondary Clarifiers will be provided with the following ancillary equipment to facilitate its standard operating conditions:

- Bridge with a bottom scraping mechanism. (To facilitate a homogenous environment within each clarifier as well as the channeling of sludge for ease of pumping);
- Scum draw off box and surface scraper. (To facilitate the draw off of scum and disposal to the drying beds in order to prevent any scum that forms from carrying over in the final effluent).

The operation of the Secondary Clarifiers must be automated with the following control approach:

- The clarifier bridge will run continuously at a steady rate;
- RAS pumping will be automatically proportionally adjusted to that of the measured plant inflow.
- The RAS pump capacities and quantities are shown in Table 10.

TABLE 10: RAS PUMPS NUMBERS AND CAPACITIES

RAS recycle streams	Number of pumps	Pumping capacity (Mℓ/day per pump)
Combined RAS return	2 duty, 1 standby	16.0

3.3.5. DISINFECTION

It is essential to provide reliable disinfection of the treated wastewater, before discharge to the river. This is imperative from a public health perspective.

It is proposed to use chlorine gas as disinfectant. The chlorine gas is dosed as a solution (dosing system allows for the Chlorine gas to dissolve in a small stream of treated effluent) directly into the treated effluent flow. The process requirements for effective disinfection are as follows:

- Effective mixing and dispersion of the chlorine solution into the mainstream treated flow. This mixing can be achieved, using hydraulic or mechanical energy.
- Plug flow of the chlorinated effluent and no short-circuiting in the contact tanks. Care must be taken to prevent thermal stratification and to prevent non-ideal flow conditions around bends.
- Sufficient contact time to achieve effective pathogenic organism kill. The typical nominal design contact time is 30 minutes at average design flow.

The chlorine contact tank volume is 340 m^3. The channel design parameters are summarised in Table 11.

TABLE 11: CHLORINE CONTACT CHANNEL DESIGN PARAMETERS

Parameters	Average flow	Peak dry weather flow	Peak wet weather flow
Flow (Mℓ/day)	16	30.4	43.5
Contact time (mins)	30.4	16.1	11.3
Volume of channel (m^3)	340	340	340

THE REQUIRED DOSING VOLUMES OF CL_2 GAS IS SUMMARISED IN TABLE 12

TABLE 12: REQUIRED DOSING OF CL_2

Parameters	Average flow	Peak dry weather flow	Peak wet weather flow
Flow (Mℓ/day)	16	30.4	43.5
Cl_2 dosage:			
- mg/ℓ	2	2	3
- kg/hour	1.33	2.53	3.61

The final effluent flow rate will be measured and monitored in-line in terms of free chlorine and electrical conductivity. The complete de-chlorination of the treated water will be ensured by the allowed residence time in the polishing wetland

The operation of the Chlorine Contact Channel Clarifiers must be automated with the following control approach:

- The flow through the channel will gravitational and directly depend on the measured plant inflow;
- The chlorine dosing is automated and will adjust proportionally to that of the measured plant effluent flow in order to achieve the prescribed Chlorine dosing concentration.

3.3.6. SLUDGE/WASTE TREATMENT AND DISPOSAL

SCREENINGS AND GRIT

Screenings and grit is removed at the inlet works, washed and dewatered before disposal into dedicated waste bins for removal, as described in section Table 13. The screenings and grit production is estimated as summarized in Table 13:

TABLE 13: ESTIMATED SCREENINGS AND GRIT PRODUCTION

Waste Activated Sludge Parameters	50 Percentile	95 Percentile
Grit mass (ton TS/day)	7.9	18.4
Grit volume (m^3/day)	3	7.3
Screenings Volume (m^3/day)	0.4	0.8

WASTE ACTIVATED SLUDGE

The waste activated sludge can typically be drawn from the activated sludge reactor or from the RAS line. The proposed activated sludge modules allow sludge wasting directly from the reactors. This enables accurate control of the sludge age and therefore quality of the treated effluent. It is proposed to waste sludge on a continuous basis to the sludge thickening process. The estimated WAS production is summarized in Table 14:

TABLE 14: ESTIMATED WASTE ACTIVATED SLUDGE PRODUCTION

Waste Activated Sludge Parameters	50 Percentile	95 Percentile
Sludge mass (ton TS/day)	3.5	6.8
Sludge volume (m^3/day):	975	1952

The unit production of sludge is therefore:

- 50 Percentile flow and load = 0.21 ton TS per Mℓ wastewater treated
- 95 Percentile flow and load = 0.43 ton TS per Mℓ wastewater treated

SLUDGE SCREENING AND COLLECTION

The WAS stemming from the BNR Reactor is combined with the scum drawn off from the Secondary Clarifiers as well as the scum drawn off from the BNR Reactor in a Combined Sludge Sump

The combined sludge and scum stream is screened to remove large solids and floatables, before entering the WAS Sludge Thickener. This will remove nuisance matter to improve the reliability and operability of downstream sludge treatment processes.

The Sludge Screens design is based on the following criteria:

- Number of mechanical screens = 2
- Number of bypass screens = 1
- Type of screen = front raked
- Screen field gap size = 6 mm

The operation of the screens shall be automated based on the following process control approach:

- A maximum difference in water level across the screen (upstream / downstream).
- Timer controlled operation of the screen raking mechanism with a variable time between activation of the raking mechanism and variable duration of operation of the raking mechanism.
- Override for continuous operation of the raking mechanism based on a maximum water level in the inlet channel.
- The activation of the raking mechanism shall be fitted with a manual override with "inching" facility in both the forward and reverse directions.
- The screen control settings must be adjustable on the local PLC.

The mechanical screens, conveyor belt and screenings press is interlocked for optimal operation. The screenings screw press must have a facility to reverse direction to allow removal of obstructing objects.

SLUDGE THICKENING

Waste sludge is discharged directly from the reactor(s) to the WAS thickener. The waste sludge or mixed liquor from the reactors is wasted for a set time per day in order to control the sludge age in the activated sludge process. The thickener design is similar to the Secondary Clarifier design with the following design characteristics:

- Number of thickeners = 1
- Type of thickener = centre feed with centre mechanical drive sludge scraper mechanism

Thickener dimensions:

- Diameter = 12.0 m
- Side wall depth = 4.0 m
- Floor slope = 1 : 6

The WAS thickener hydraulic and solids loading rates are as follows:

TABLE 15: SLUDGE FLOWS AND SOLIDS LOADING RATES TO WAS THICKENERS

Parameters	Median	Maximum daily
Flows (m^3/day)	975	1 950
Consistency (% TS)	0.5 – 3.5 %	
Solids loading (ton/day)	3.4	6.8

The WAS thickener is a conventional picket fence rake type thickener. The rake mechanism progressively moves the sludge towards the centre well from where it is withdrawn to the sludge drying beds for dewatering.

The WAS thickener overflow will enter the thickener overflow sump from where it will be pumped back to the head of works. The thickener overflow sump will also be used to collect the decant or filtrate from the sludge drying beds. The sump will be mixed to prevent settlement of any solids from these streams and to ensure that all solids are returned to the treatment process.

The thickened sludge from the WAS thickener will be abstracted and pumped directly to the sludge drying beds. The thickened sludge pump will be timer controlled or operated manually.

The operation of the WAS Thickener shall be automated based on the following process control approach:

- All peripheral equipment such as the bridge and rake will operate continuously and automatically;
- Sludge pumping to the Sludge Drying Beds will occur intermittently on a timer bases.

SLUDGE DEWATERING

The thickened sludge will be pumped to the sludge drying beds. The sludge will be spread out across the drying beds to maximize drying area by opening different valves along the drying bed. The sludge thickness should be no more than 300 mm thick. The sludge is left to settle and the top clear water is drawn off periodically by opening the sludge bed drainage valve. When no further clear liquor can be drawn off the sludge is left to dry out. The sludge can be turned periodically to enhance evaporation and drying.

The objective is to increase the solids content of the sludge from approximately 4 to 6 % TS after thickening to approximately 30 - 40 % TS before removal. Dried sludge can be disposed to landfill or used as fertilizer.

Sufficient allowance must be made for vehicle movement and access to the sludge drying beds to enable mechanical removal of the sludge.

The sludge drying beds are designed for the following sludge loads:

TABLE 16: SLUDGE DRYING BED DESIGN PARAMETERS

Parameters	
Flow (m^3)	84.5
Solids loading ($kgTS/m^2/year$	150
Area required (m^2)	8 230
Depth of sludge layer (mm)	300
Number of drying beds	8

The sludge drying bed sizing is based on the following criteria:

- Sludge spreading thickness = 300 mm;
- Sludge drying time = 21 - 30 days (winter);
- Solids loading per m^3 = 150 $kg/m^2/year$.

One sludge bed can be used for scum drying only with no decant return to the process in case of filamentous organisms proliferation in the reactor. If the need arises to decant liquid from the bed containing the scum the addition of granular chlorine (HTH) is recommended.

POLISHING WETLAND

The process design includes a polishing wetland that will serve as a final polishing process. Should a process upset occur, or high storm flows reach the WWTW, the impact of such an upset condition on the effluent quality and final discharge should be mitigated. In the event of load shedding or interruptions in electricity supply, the wetland will provide limited mitigation to the discharge of untreated sewage directly to river. The wetland design criteria are as follows:

- Wetland surface area: 2.3 ha;
- Retention time: 8.5 hr;
- Depth: 0.6 m;
- Average hydraulic load at ADWF of 16 Mℓ/d.

The wetland will assist with the removal of residual suspended solids and COD and will also remove residual chlorine. The wetland design is based on a vertical flow configuration to maximize flow through the root zone of the reeds or vegetation. The effluent will be collected in an underground drainage system and the cells will be filled with a coarse medium with a porosity of 10 times the loading rate.

4. ACTIVITIES TO DATE

4.1. SCREENING

The following legislation applies to this project in order to complete a successful Environmental and Social Impact Assessment (ESIA):

- National Environmental Management Act (No. 107 of 1998)
- National Environmental Management: Waste Act (No. 59 of 2008)
- National Heritage Resources Act (No. 25 of 1999)
- National Water Act (No. 36 of 1998)

4.1.1. NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998)

The following listed activities under NEMA have been triggered by the proposed construction of the new WWTW:

- **Activity number 9 of GN.R.544**

The construction of facilities or infrastructure exceeding 1000 meters in length for the bulk transportation of water, sewage or storm water;
i. with an internal diameter of 0,36 meters or more; or
ii. with a peak throughput of 120 liters per second or more,
Excluding where:
a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or
b. where such construction will occur within urban areas but further than 32 meters from a watercourse, measured from the edge of the watercourse.

The new outfall sewer is approximately 5 000 meters in length. Outfall sewer: 1.05 meter (1 050 mm) diameter concrete outfall sewer laid at a slope of 0.1% Capacity: Accommodate the Peak Wet Water Flow of 503 ℓ/s (0.503m^3/s).

- **Activity number 10 of GN.R.544**

The construction of facilities or infrastructure for the transmission and distribution of electricity:
i. outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or
ii. inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.

Power will be supplied to the plant via an 11 kV overhead line from the exiting sewage plant down to the new plant.

- **Activity number 11 of GN.R.544**

The construction of:
(i) Canals;
(ii) Channels;
(iii) Bridges;
(iv) Dams;
(v) Weirs;
(vi) Bulk storm water outlet structures;
(vii) Marinas;
(viii) Jetties exceeding 50 square meters in size;
(ix) Slipways exceeding 50 square meters in size;
(x) Buildings exceeding 50 square meters in size;
(xi) infrastructure or structures covering 50 square meters or more where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such
Construction will occur behind the development setback line.

Where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

A channel/pipeline must be built in order to supply drinking water to the plant as well as a pipeline for recycled water. Storm water outlet structures will need to be constructed too. Buildings will also be built: Office, Lab, Admin building, Electrical substation, Control building, Chlorination, Workshop, Warehouse, Dosing building

Estimated footprint: 500m x 500m

Storm water diversions required to keep WWTW safe

- **Activity number 12 of GN.R.544**

The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010;

Estimated holding capacity of the plant: 28 day sludge age.

- **Activity number 22 of GN.R.544**

The construction of a road, outside urban areas,

(i) With a reserve wider than 13,5 meters or,

(ii) Where no reserve exists where the road is wider than 8 meters, or

(iii) For which an environmental authorization was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.

8 meter service road

- **Activity number 23 of GN.R.544**

The transformation of undeveloped, vacant or derelict land to

(i) residential, retail, commercial, recreational, industrial or institutional use, inside an urban area, and where the total area to be transformed is 5 hectares or more, but less than 20 hectares, or

(ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares;

Except where such transformation takes place for linear activities.

Total footprint: ±25 ha

- **Activity number 27 of GN.R.544**

The decommissioning of existing facilities or infrastructure, for

(i) Electricity generation with a threshold of more than 10MW;

(ii) Electricity transmission and distribution with a threshold of more than 132kV;

(iii) Nuclear reactors and storage of nuclear fuel;

(iv) Activities where the facility or the land on which it is located is contaminated;

(v) Storage, or storage and handling, of dangerous goods of more than 80 cubic meters;

But excluding any facilities or infrastructure that commenced under an environmental authorization issued in terms of the Environmental Impact Assessment Regulations, 2006 made under section 24(5) of the Act and published in Government Notice No. R. 385 of 2006, or Notice No. 543 of 2010.

Decommissioning, demolishing and rehabilitation of old plant.

- **Activity number 28 of GN.R.544**

The expansion of existing facilities for any process or activity where such expansion will result in the need for a new, or amendment of, an existing permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.

The proposed development is applicable to the National Environmental Management: Waste Act (Act No. 59 of 2008).

- **Activity number 56 of GN.R.544**

Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where anyone phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold;
Excluding the following activities listed in this Schedule:
2; 11 (i)-(vii); 16(i)-(iv); 17; 19; 20; 22(i) &22(iii); 25; 26; 27(iii) & (iv); 28; 39; 45 (i)-(iv) & (vii)-(xv); 50; 51; 53; and 54;

Phase 1: 16 Mℓ/day - Year 1

Phase 2: 24 Mℓ/day - Year 10

- **Activity number 6 of GN.R.545**

The construction of facilities or infrastructure for the bulk transportation of dangerous goods -
(i) In gas form, outside an industrial complex, using pipelines, exceeding 1000 meters in length, with a throughput capacity of more than 700 tons per day;
(ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 meters in length, with a throughput capacity more than 50 cubic meters per day; or
(iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.

Sewage pipelines will be more than 1000 meters in length.

- **Activity number 10 of GN.R.545**

The construction of facilities or infrastructure for the transfer of 50 000 cubic meters or more water per day, from and to or between any combination of the following:
(i) Water catchments,
(ii) Water treatment works; or
(iii) Impoundments,
excluding treatment works where water is to be treated for drinking purposes.

A maximum amount sewage water of 43 459.2 m^3/d (0.503 m^3/s) will be handled at the 16 Mℓ/d sewage plant with further increase for the 24Mℓ/d sewage plant.

- **Activity number 15 of GN.R.545**

Physical alteration of undeveloped vacant or derelict land for residential, retail commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;
Except where such physical alteration takes place for:
(i) Linear development activities; or
(ii) Agriculture or afforestation where activity 16 in this Schedule will apply.

Total footprint: ±25 ha

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

Section 21 under the National Water Act (NWA) also applies to the WWTW. The following activities have been triggered:

- **(f) of Section 21 under NWA**

Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

Effluent water will flow into a water resource – the Bles Spruit.

- **(g) of Section 21 under NWA**

Disposing of waste in a manner which may detrimentally impact on a water resource;

Effluent waste water will be discharged into a water stream after being treated.

- **(i) of Section 21 under NWA**

(i) altering the bed, banks, course or characteristics of a watercourse;

The effluent water will be used for irrigation or discharged into a watercourse which might be altered due to increased flow.

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

A few activities of the National Environmental Management: Waste Act 59 of 2008 has been triggered during the screening process. Below is a summary of findings:

- **Category A (15)**

The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity).

A new sewage treatment plant will be constructed.

- **Category B (1)**

The storage including the temporary storage of hazardous waste in lagoons.

Hazardous waste to be temporarily stored at the sewage treatment facility in lagoons.

- **Category B (2)**

The reuse and recycling of hazardous waste.

Effluent will be recycled, but waste will first be treated to acceptable levels.

- **Category B (4)**

The biological, physical or physico-chemical treatment of hazardous waste at a facility that has the capacity to receive in excess of 500 kg of hazardous waste per day.

The facility will receive in excess of 500 kg of waste per day. Hazardous waste will be treated with Chlorine to reduce E-coli to an acceptable level. Treatment by means of activated sludge. Phosphate and nitrates need to be removed. A BNR (biological nutrient removal process) activate sludge process is required.

- **Category B (5)**

The treatment of hazardous waste using any form of treatment regardless of the size or capacity of such a facility to treat such waste.

Hazardous waste will be treated with Chlorine to reduce E-coli to an acceptable level. Treatment by means of activated sludge. Phosphate and nitrates need to be removed. BNR (biological nutrient removal process) activate sludge process is required.

- **Category B (6)**

The treatment of hazardous waste in lagoons.

Hazardous waste will be treated in the sewage treatment facility.

- **Category B (7)**

The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic meters or more.

The plant will treat 16 000 cubic meters of waste water per day.

- **Category B (12)**

The construction of facilities or activities listed in Category B of this Schedule (not in isolation to associated activity)

A new sewage plant will be constructed.

The following application for full Scoping and Environmental Impact Report has therefore been submitted to the competent authority, namely:

- *ESIA Application to the Department of Environmental Affairs, North West Province*

4.2. SUMMARY OF PROJECT ALTERNATIVES

NEMA[64] prescribes guidelines to help with the selection of alternatives. According to this guideline the general objective of integrated environmental management is, *inter alia,* to "identify, predict and evaluate the actual and potential impact on the environment, socio-economic condition and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits, and promoting compliance with the principles of environmental management".

The project team evaluated the different alternatives for the project in terms of the following sections: Treatment Process (Main Stream), Waste streams disposal, Air emissions, Environmental and Financial. These sections were divided into sub-sections according to suitable and applicable divisions. A four point measuring tool was used to classify the different subsections: Positive, Marginal, Negative and No effect. The no-go option was also considered here. Below is a summary of the decisions:

- A gravel service road will be constructed with a width of 8 meters to allow for dual carriage. This road will be constructed along the outfall sewer. In the future, a new access road is required with a level crossing the railway line.
- The outfall sewer will be put underground. It will be a 115 diameter concrete pipe with sacrificial layer and corrosion analysis.
- Neither balancing tank nor a storage tank will be constructed. Settling tanks will be used for the processing of treating the sewage – sedimentation settling will take place in the tanks.
- It is preferred by the engineers not to have a pump station.
- A 6.6 kV power line is required. This will be an overhead high tension line. There is a possibility that Eskom will be the electricity supplier or otherwise solar energy will be used.
- The four process alternatives all have the same Preliminary Treatment consisting of an inlet works designed with mechanical screening and degritting. The following four process alternatives were evaluated:
    - Anaerobic ponds with trickling filters;
    - Extended aeration process;
    - Biological Nutrient Reactor (BNR) – Activated sludge process;
    - Biological Nutrient Reactor (BNR) – Activated sludge process with preliminary settling and sludge digestion

4.3. PUBLIC PARTICIPATION

4.3.1. OBJECTIVES OF THE PUBLIC PARTICIPATION PROCESS

The objective of the Public Participation Process (PPP) is to ensure a legally compliant process with stakeholders to provide project information to them in a meaningful way and obtain information from them as a community to enhance the project.

This objective will be achieved by implementing the following goals:

- Identification, analysis and engagement of stakeholders in the planning, permitting and construction stages of the project lifecycle in a proactive manner
- Categorization of the identified stakeholders on the basis of their engagement with the Project relating to the functions of specific Departments
- Identification of representatives of different categories of stakeholders who will be representing their group in meetings and consultations
- Devising engagement mechanisms appropriate for this specific engagement process and groups
- Ensuring that the required systems are in place to report and record any question, complaint, grievance or incident raised by the stakeholders in general and the local community

[64] DEA & DP. (2009). *NEMA Environmental Impact Regulations Guideline and Infromation Document Series.* Cape Town: Department of Environmental Affairs and Development Planning.

For the purpose of this PPP, stakeholder engagement is defined as a broad and inclusive interaction that encompasses consultation, disclosure, negotiation, the formation of partnerships, resolution of grievances, and participatory monitoring and reporting. It includes all areas of stakeholder contact during all phases of the proposed Vryburg Waste Water Treatment Works. For the purpose of this project, The Project from here on will be defined as the planning, permitting, operation and construction of the Vryburg WWTW.

4.3.2. WHO ARE THE STAKEHOLDERS OF I & APS

The Stakeholders can be defined as a group of individuals or a person who has an interest "…in achieving the same goals that guides participation in action and projects"[65]. These individuals can also be described as having a vested interest in an activity or a project and once these individuals or organizations want to be involved in a given project or activity, they can be classified as an stakeholder.

The Stakeholders that have been identified up to this point in the project can be classified into four main groups namely, the public sector, the private sector, non-governmental (civil society) organizations (NGOs) and community-based organizations (CBOs).

The public sector stakeholders consist of the following national and provincial departments:

- The North West Department of Economic Development, Environment, Conservation and Tourism
- The National Department of Environmental Affairs
- The North West Department of Public Works, Roads and Transport
- The Free State's Department of Water Affairs and Forestry
- Vryburg Post Office
- Dr. Ruth S. Mompati District Municipality
- Naledi Local Municipality

The private sector Stakeholders consists of the following industries:

- Mafa Cleaning and Projects
- KLS Attorneys

The NGO sector Stakeholders consists of the following organizations:

- Khulisa
- Age In Action
- Andrew Babeile Foundation
- Bophirima Youth Development
- AfriForum
- Naledi Community Development Network

The CBO sector Stakeholders consists of the following organizations:

- Huhudi Health Centre
- Tswelelopele Centre for the aged & disabled

[65] Maxim Planning Solutions (Pty) Ltd. (2012). *Naledi Local Municipality Spatial Development Framework.* Vryburg: Maxim Planning Solutions (Pty) Ltd.

4.3.3. PUBLIC PARTICIPATION ACTIVITIES

Up to date the following public participation activities have been completed:

Item	Date	Venue	Communication Media	Communication Vehicle	Attendees	Recipients
Project Orientation Meeting 1	2013/06/12	Dr. Ruth S. Mompati District Municipality Office	Verbal	Electronic mail distribution	Briefing was held for Dr. Ruth District Municipality Ward Councilors	Not Applicable
Project Orientation Meeting Briefing	2013/06/12	Dr. Ruth S. Mompati District Municipality Office	Verbal	Electronic mail distribution	Dr. Ruth District Municipality & Naledi Local Municipality Ward Councilors	Not Applicable
Project Orientation Meeting 3	2013/07/12	Dr. Ruth S. Mompati District Municipality Office	Verbal	Electronic mail distribution	Dr. Ruth District Municipality, Naledi Local Municipality Ward Councillors & Naledi Local Municipality Mayor	Not Applicable
Landowner Meeting	2013/06/12	KLS Attorneys Office	Verbal	Hard copy overview of project and ESIA process	Mrs. Van der Merwe. Chrizette Neethling	Mrs. Van der Merwe
Landowner Meeting	2013/08/21	KLS Attorneys Offices	Verbal	Electronic mail distribution	Louis van der Merwe, Ms van der Merwe, Braam Swanepoel, Paul van der Merwe, Walter Jood, Jones Seichoko, Herman Swanepoel, Thys Beukes, Albert van Niekerk, Onno Fortuin	Not Applicable

Advertisements Published- Daily Sun	2013/14/10	Not Applicable	Telecommunication	SMS Notification	Not Applicable	Project Team, Project Technical Team, District and Local Municipality's Ward Councilors.
Advertisements Published- The Stellalander	2013/10/02	Not Applicable	Telecommunication	SMS Notification	Not Applicable	Project Team, Project Technical Team, District and Local Municipality's Ward Councilors and Initial Registered I&APs.
Distribution of Background Information Document	2013/10/01	Not Applicable	E-communication	Electronic mail distribution	Not Applicable	Project Team, Technical Team, District and Local Municipality's Ward Councilors.
Distribution and public placement of Notification BID Posters & Invite to Comment and Register	2013/09/27	Post Office, Municipal Office, Existing Sewage Works, Library, Police Station, Shopping Mall Notice Board, Community Centre, Education Centre, Provincial Department of Public Works, Tswelopele Centre for the Aged & Disabled and Huhudi Health Centre.	Printed and Posted	Posted copies distributed and placed at each location	Not Applicable	Initial Registered I&APs.

Presently the Stakeholders have mainly been identified by the cooperation between the Independent Environmental Practitioner (EVES) and the District Municipality, Dr RSM. Other processes that have been used to identify and register various Stakeholders were through public notification about the project by way of advertisements, SMS notification and invites to comment and register as I&APs. All of these processes were used to notified the public and civil society of the proposed project and encouraged them to contact the Independent Environmental Practitioner if they were interested in registering as an I&AP or requested more information surrounding the project.

4.3.4. PUBLIC PARTICIPATION DURING THE IMPACT ASSESSMENT PHASE

The diagram below sets out the four different phases as well as each process's details of the planned project:

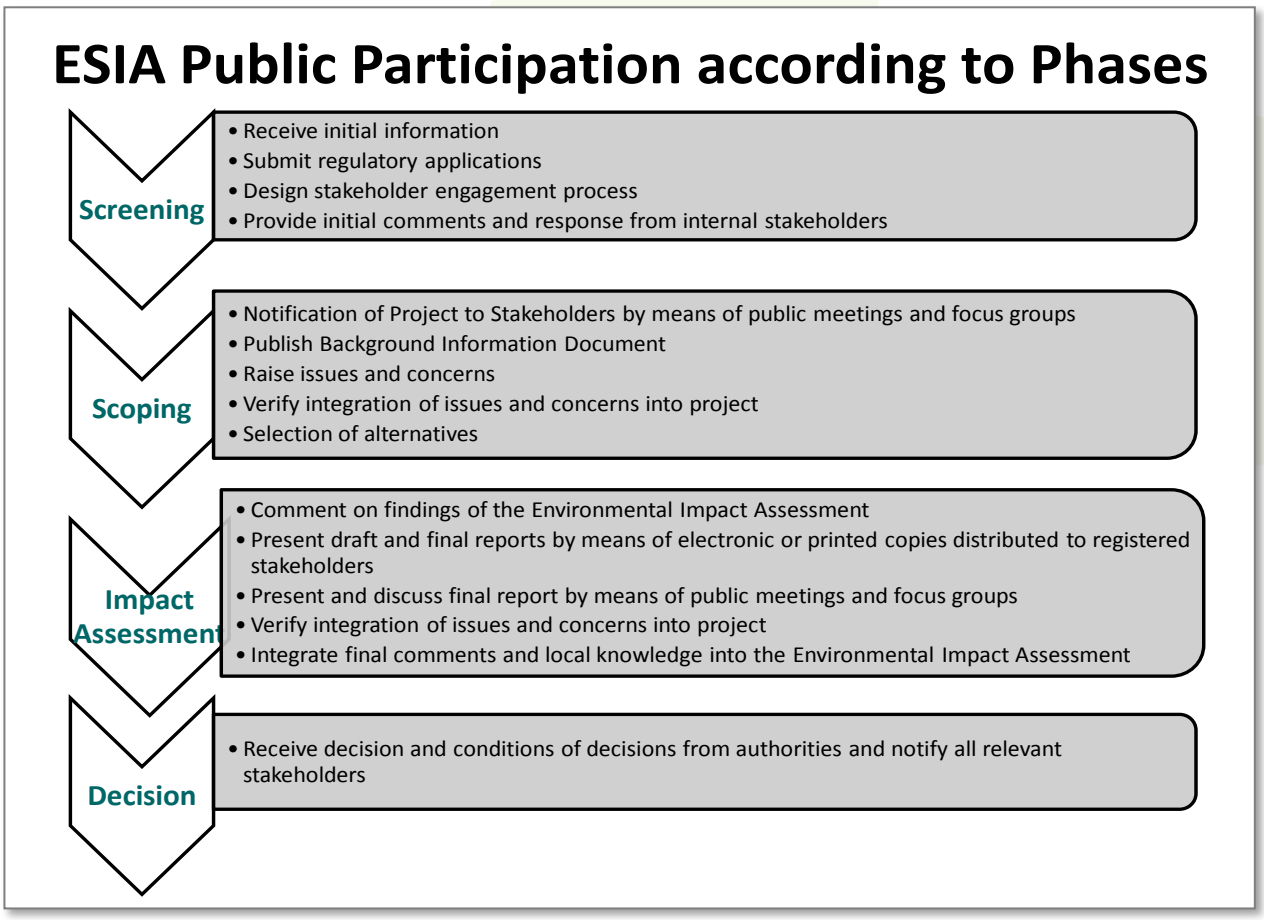

FIGURE 19: ESIA PUBLIC PARTICIPATION PHASES

4.3.4.1. NEXT STEPS IN THE ESIA PROCESS

To date a Stakeholder Database has been compiled with the details of the initial Stakeholders of the project. This list has been compiled from businesses, departments, NGOs and CBOs that the District Municipality has supplied to the Independent Environmental Practitioner as well as Stakeholders that have registered at this stage.

Moreover, the first two public meetings have been arranged and ready to commence on the 6th of November, 2013. The public meetings will take place at two different venues and at two different times in the attempt to accommodate individuals from various wards. Two advertisements have also been placed in local and national newspapers, The Stellalander and The Daily Sun, on the following dates:

- The Stellalander: 2013/10/04
- The Daily Sun: 2013/10/07 & 2013/10/14

On these same dates a SMS notification was sent to the Project Team, Project Technical Team, District and Local Municipality's Ward Councilors and Initial Registered I&APs.

Following the closing date of the registration period for I&APs, the Draft Scoping Report, which will include the Plan of Study for Impact Assessment and Comment and Response Report (CRR) will be made available for a period of 60 days for public review.

At the end of the public review period of DSR, the stakeholder engagement report will be updated and incorporate the issues raised at the community and public meetings as well as those received in writing on the DSR into the CRR to accompany the Final Scoping Report (FSR). Before the FSR is to be handed in, two public meetings will again be held at two various venues to ensure the community's final responses on the project is captured.

In line with the ESIA Regulations the FSR has to be made available for public comment for a period of 21 days before submission to the competent authority.

Following the submission of the FSR, registered I&APs will receive a letter to notify them if the competent authority has approved the FSR, and that the impact assessment may proceed. The letter will indicate when the Draft ESIA/EMP Report would be available for public review and the public places where the documents will be on display. In addition, an advertisement announcing the availability of the Draft ESIA/EMP Report and inviting stakeholders to open days will be published in newspapers as indicated newspapers.

As during the Scoping Phase, a period of 60 days will be available for public review of the Draft EIA/EMP Report, specialist studies and CRR. The reports will be distributed for comment.

At the end of the public review period of Final EIA/EMP Report, the stakeholder engagement report will be updated and the issues raised at the public meeting as well as those received in writing on the Final EIA/EMP Report will be incorporated into the CRR to accompany the Final EIA/EMP Report.

In line with the EIA Regulations the Final EIA/EMP Report has to be made available for public comment for a period of 21 days before submission to the competent authority. Registered I&APs will be notified by mail/email of the availability of the Final EIA/EMP Report for public comment. Upon closure of the comment period, additional comments will be received and submitted as an addendum with the Final

EIA/EMP Report to the competent and commenting authorities.

After the competent authorities have accepted/denied the Final EIA/EMP Report, registered I&APs will be notified of authorities' decision and appeals procedure.

5. PLANNED ACTIVITIES

5.1. PUBLIC PARTICIPATION

The following activities are planned for the project's Public Participation Process:

- Stakeholder Identification and Analysis
- Compilation of an Stakeholder Master list
- Public Notifications via bulk SMS service
- Stakeholder Consultation through community meetings
- Reporting to Stakeholders
- Negotiation with Stakeholders

The following process will be followed and allow for public input:

Activity	End Date
Submission of Application forms	3rd Quarter 2013
Submit Draft Scoping Report to all registered stakeholders for comments	4th Quarter 2013
Submit Draft ESIA & EMP Report to all registered stakeholders for comments	1st Quarter 2014
Submit Final ESIA & EMP Report to all registered stakeholders for comments	2nd Quarter 2014
Submit Final Scoping, ESIA & EMP Report to all authorities	2nd Quarter 2014

5.2. SPECIALIST STUDIES

To complete this project successfully, professional input is required. Specialists went to the site on the 22nd of May 2013 to conduct field work in order to write a report to give more depth to the project. The following specialists were consulted in this study:

Specialist	Field of Expertise	Company
Dr David Morris	Heritage and Archaeology Specialist	Head of Archaeology: McGregor Museum
Danie Brink	Hydrology and Groundwater Specialist	Golder Associates Africa (Pty) Ltd
Simon Todd	Ecology Specialist	Simon Todd Consulting
Soilkraft	Geotechnical Survey	Soilkraft & J.K Developments
Onno Fortuin & Derek Lambert	Flood line and Storm water Specialists	Onno Fortuin Consulting & Diesel and Munns

The specialists received a scope of works to inform them about what is planned for the project. Below is the problem statement presented to each specialist in addition to the project scope provided to each specialist from which their terms of reference were conceptualized:

Problem Statement

The present situation impacting the town of Vryburg in a drastic manner is that the existing Wastewater Treatment Works can no longer accommodate the sewage flow and load.

Various new housing developments are in progress and form part of a much bigger housing initiative for Vryburg and are planned in a phased manner. **Phase 1** involves a low-cost housing development where 1 500 units are being built and will be completed by August 2009. This additional load will then impact the already over-loaded treatment works. **Phase 2** of the housing developments was approved during March 2009 and this will be completed by 2011 when an additional 3 000 housing units will be connected to the sewer network of Vryburg. The **Phase 3** development will accommodate another approximate 2 000 housing units that will be completed by 2012. A portion of Phase 3 involves approximately 850 housing units that will not be able to gravitate to the existing treatment works.

An aggravating factor is that there is limited scope for upgrading of the existing Works as the site has very little expansion options available. Towards the north-east the Bles Spruit borders the site, whilst to the south and west the Huhudi Township has grown right up against the Works. This expansion of Huhudi is such that the Works does not comply with health regulations where the minimum clearance to households has for some time now been encroached.

From the current IDP Review Document for Dr. RSM DM(2009/2010), the current backlog in terms of un-serviced households for the Naledi Municipality amounts to 1 147 households which, is representative of 11% of the total population of the total Naledi Municipal population. The number of these households draining to the existing Vryburg Works is not known at this stage.

New waste water treatment plant

The figure below shows a possible location for such a new treatment works located down-stream along the Bles Spruit, approximately 5 km from the existing works in a more south easterly direction.

By establishing a new Works, the site of the existing Works can be remediated allowing for densification and developments within Vryburg and surrounding townships. Such developments can be in closer proximity to the central business district.

The following terms of reference are applicable to the different specialists.

Heritage and Archaeology Specialist

The following heritage and archaeology terms of reference applies:

1. Professional fee survey & research for heritage survey
2. Desktop study and report writing (scoping)
3. Site visit by Heritage Specialist to conclude survey
4. Report on field survey
5. Incorporation of results into ESIA.

Hydrology and Groundwater Specialist

The following hydrology and groundwater terms of reference applies:

1. Professional fee survey & research for groundwater survey
2. Site visit by Hydrologist to conclude survey
3. Report on field survey
4. Incorporation of results into ESIA.

Geotechnical Specialist

The following geotechnical terms of reference applies:

1. Desktop study to determine requirement for geotechnical survey.
2. Site visit by Geotechnical Engineers to interpret the gravity survey
3. Placement and drilling of 13 geotechnical boreholes for the more detailed dolomitic investigations.
4. Mapping and report on drilling results
5. Incorporation of results into ESIA

Flood line and Storm water Specialists

1. Site visit
2. Initial survey
3. Radar Orthophoto flying
4. Ground truthing
5. Fine scale mapping of contours
6. Catchment flow analysis
7. Storm water management plan
8. Incorporation of results into ESIA.

5.3. EIA AND EMP

The environmental impact assessment will be conducted using the specialist studies, technical designs and final scoping report as reference.

The ESIA will apply sstandard evaluation methods as defined below.

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. Assessment of impacts will be based on DEAT's (1998) Guideline Document: EIA Regulations.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts will be determined through a synthesis of the criteria below:

Probability This describes the likelihood of the impact actually occurring.	
Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable:	It is most likely that the impact will occur at some stage of the development.
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mediatory actions or contingency plans to contain the effect.

Duration: The lifetime of the impact.	
Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
Medium term:	The impact will last up to the end of the phases, where after it will be negated.
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
Permanent:	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale:	**The physical and spatial size of the impact**
Site:	The impacted area extends only as far as the activity, e.g. footprint
Local:	The impact could affect the whole, or a measurable portion of the above mentioned properties and adjacent properties.
Regional:	The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity:	**Does the impact destroy the environment, or alter its function.**
Low:	The impact alters the affected environment in such a way that natural processes are not affected.
Medium:	The affected environment is altered, but functions and processes continue in a modified way.
High:	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance	This is an indication of the **importance of the impact** in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

Upon approval of the Final Scoping Report, the Draft ESIA Report will be compiled and distributed for public and authority comment. The Draft ESIA Report will contain the findings of all specialist studies, together with an Environmental Management Plan report which will outline measures to mitigate and manage potential impacts.

5.4. OTHER PERMITS AND AUTHORISATIONS

The selected location for the project is situated on an extensive privately owned farm and land-use as well as landownership adjustments are required for the project. During the scoping phase the rezoning and subdivision applications will be processed to ensure local and provincial planning authorisations are obtained in support of the greater project.

Parallel to the above ESIA process specialist study assessment and submissions will be presented to the South African Heritage Resources Association (SAHRA) to secure permissions in terms of any cultural heritage impacts that may be relevant to the project.

Upon issuing, the Environmental Authorisation and Waste Management License will be forwarded to the Department of Water Affairs (DWA) for this department to commence with their decision making period.

The Department of Water Affairs (DWA) is not subject to a regulated timeframe for decision making on water use license application. It is the objective of the project to submit the required Water Use License Application in such a manner that DWA can review and issue a decision upon receipt of the ESIA and Waste Management License authorisations.

A pre-construction permissions check will be conducted to ascertain if any additional permits are required before construction can commence. This will include a national level evaluation of possible impacts on nationally protected flora and a provincial level evaluation of provincially protected flora.

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