DRAFT FOR PUBLIC REVIEW

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE UPGRADE OF THE MARAPONG WASTEWATER TREATMENT PLANT

DEA REF NO: 12/9/11/L934/5

LEPHALALE LOCAL MUNICIPALITY

DECEMBER 2012

Digby Wells & Associates (Pty) Ltd. Co. Reg. No. 1999/05985/07. Fern Isle, Section 10, 359 Pretoria Ave Randburg Private Bag X10046, Randburg, 2125, South Africa

Tel: +27 11 789 9495, Fax: +27 11 789 9498, info@digbywells.com, www.digbywells.com

Directors: A Sing*, AR Wilke, LF Koeslag, PD Tanner (British)*, AJ Reynolds (Chairman) (British)*, J Leaver*, GE Trusler (C.E.O)

*Non-Executive

DIGBY WELLS ENVIRONMENTAL

This document has been prepared by **Digby Wells Environmental**.

Report Title: **Environmental Impact Assessment and Environmental Management Programme for the Upgrade of the Marapong Wastewater Treatment Plant**

Project Number: **RES1167**

Name	Responsibility	Signature	Date
Naledi Moeketsi	Report Writer		09 November 2012
Louise van den Berg	1st Review - Project Manager		05 November 2012
Stephanie Aken	2nd Review – Unit Manager: Legal and Compliance		15 November 2012
Andries Wilke	3rd Review – Director: Business Development		21 November 2012

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COMMENTS ON THIS DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

In accordance to the National Environmental Management Act, Act No. 107 of 1998 as amended (NEMA), Constitutional Principles and the Promotion of Administrative Justice Act, Act No. 3 of 2000 (PAJA), Interested and Affected Parties (I&APs) must be given an opportunity to comment on proposed projects which may impact on their environmental right.

The purpose of the public review process is to allow I&APs to review this draft Environmental Impact Assessment (EIA) Report and Environmental Management Programme (EMP). This ensures that comments raised during the public participation process can be addressed before completion and submission of the final document to the competent authorities. All I&AP comments will be recorded and will form part of the findings.

This draft EIA & EMP Report is compiled in support of a waste licence application for the proposed upgrade of the Marapong Wastewater Treatment Plant (MWWTP). The study area falls within the Lephalale Local Municipality (LLM) and the Waterberg Magisterial District on the farm Zongezien 467 LQ in the Limpopo Province.

Digby Wells Environmental (Digby Wells) is the appointed independent consultant responsible for assessing the environmental and social impacts of the proposed project and documenting the applicants proposed controls for dealing with the key environmental aspects and social issues identified.

This draft EIA/EMP is available for public review electronically at www.digbywells.com and in hard copy at the following locations:

Place	**Telephone Number**
Marapong Community Library	(014) 768 3927
Digby Wells Environmental www.digbywells.com	(011) 789 9495

DUE DATE FOR COMMENTS: 04 March 2013

You may comment on this draft report by: post; email and/or fax.

Digby Wells Environnemental:
Att : Lerato Ratsoenyane / Naledi Moeketsi
Private Bag X10046, Randburg, 2125
Tel: 011 789 9495: Fax: 086 502 1589

Email: lerato.ratsoenyane@digbywells.com or naledi.moeketsi@digbywells.com

PROJECT DETAILS

Name of Project:	Upgrade of the Marapong Wastewater Treatment Plant
DEA REF NO:	12/9/11/L934/5
Applicant:	Lephalale Local Municipality
Contact Person:	Bob Naidoo
Postal Address:	Corner Joe Slovo and Douwater Streets, Onverwacht
Telephone No:	(014) 762 1409
Fax No:	(014) 763 5662
Email:	bob.naidoo@lephalale.gov.za

Environmental Consultant	Digby Wells Environmental
Contact Person:	Naledi Moeketsi
Postal Address:	Private Bag X10046, Randburg, 2125
Telephone No:	(011) 789 9495
Fax No:	(011) 789 9498

EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) has been appointed by the Lephalale Local Municipality (LLM) to compile the necessary studies required as part of its waste licence application in terms of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA).

The proposed project involves the upgrade of the Marapong Wastewater Treatment Plant (MWWTP) as part of the Marapong - Boikarabelo Effluent Transfer (MBET) project.

PROJECT DESCRIPTION

Ledjadja Coal (Pty) Ltd (Ledjadja Coal) requires additional water for the planned Boikarabelo Coal Mine and part of the options considered included securing treated municipal effluent from the MWWTP and pumping it to the mine.

The current situation at the existing MWWTP was assessed by Ceenex Management Engineers (Ceenex) with regards to current supply and demand and it was found that the current flow and loading to the oxidation pond system exceeds the installed capacity of 0.65 Ml/d substantially. The current measured flow and load is equivalent to 3.1 Ml/d. This results in the discharge of insufficiently treated sewage effluent into the river system, causing serious pollution. The LLM engaged with Ledjadja Coal and reached an agreement to construct a 16 Ml/d wastewater treatment plant for the Municipality at Marapong. The duration of the proposed agreement will be 30 years or until Boikarabelo Coal Mine stops operating as a result of market or regulatory events, depending on whichever comes first or last.

The upgrade of the treatment plant will involve the construction of a nutrient removal activated sludge wastewater treatment plant. This new infrastructure will cover an approximate area of 15.33 ha on Portion 2 and Portion 3 of the farm Zongezien 467 LQ which is owned by the LLM.

The proposed extended aeration activated sludge plant will have two reactor compartments comprising anoxic and aerobic zones. The purpose of the aerobic zone is to remove the carbon based organic materials by using aerobic bacteria and oxygen addition. The ammonia in the sewage will be oxidised using oxygen and nitrifying bacteria in a two-step process, converting the ammonia to nitrites and then to nitrates. The purpose of the anoxic zone is to allow the reduction of the nitrates to nitrogen gas using bacteria that grows in the absence of oxygen.

The new cells formed as well as the dead cells in the reaction are separated from the liquid stream in the form of a flocculent sludge in settling tanks also referred to as clarifiers and then recirculated using a specific recirculation ratio to ensure optimal biomass growth and settling properties. In order to maintain a healthy and balanced activated sludge culture, the activated sludge is maintained at a design sludge age of about 20 days. This requires one

twentieth of the volume of the reactor to be wasted daily in the form of waste activated sludge.

It is proposed that the waste activated sludge be transferred to a sludge maturation pond in order to increase the sludge age before it is pumped to a sludge dewatering unit. The stabilised, nuisance free, dried sludge will then be placed on a composting slab, where it will be turned into compost for use as a conditioning agent for mine rehabilitation.

The clarified treated effluent, free of suspended solids and organic materials will then be disinfected to oxidise all remaining bacteria and pumped to the mine for use in its production processes.

LEGAL FRAMEWORK

The development of the activated sludge wastewater treatment plant will require an Environmental Impact Assessment and an Environmental Management Programme (EIA/EMP) in terms of the NEM:WA to obtain a Waste Licence.

A Water Use Licence (WUL) will also be required in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA).

PROJECT ALTERNATIVES

The selected option, yielding the lowest total cost of ownership for the LLM would be to provide for one treatment facility, at the existing MWWTP site instead of doubling of the current infrastructure with an identical expansion.

The following project alternatives were considered:

- The second best option for the LLM would be to construct a brand new facility at an alternative site located at R510 and Vogelstruisfontein;
- Another alternative for the LLM will be to keep the existing plant at Marapong open and do all future extensions at Paarl; however this would not be economically viable; due to financial constraints; and
- In addition, other technology options were also considered including single batch reactor units, high rate clarification, attached growth options and combined attached growth and suspended growth reactors, with and without chemical treatment. Taking into account the project objectives, the proposed biological nutrient removal activated sludge plant provided the best long term sustainable solution.

DESCRIPTION OF AFFECTED ENVIRONMENT

Soils and land capability

The land type Bc44 is dominant in the project area. This land types can contain well drained red and yellow soil in the upland positions, but may contain water logged soil in lowland and valley bottom positions.

Soils at the proposed project area are represented by Plinthic catena: eutrophic; red soils widespread, upland duplex and margalitic soils rare.

Surrounding land types are represented by Ah85 and Ae252.

The Ah land type contains red well drained high base status soils. The Hutton soil form is well represented in this land type. The soils are non-structured and the A horizon contains 6 – 12% clay. Soil texture represents a sandy loamy textured soil.

The Ae land type contains red well drained low base status soils. The Hutton soil form is well represented in this land type. The soils are non-structured and the A horizon contains 6 – 12% clay. Soil texture represents a sandy loamy textured soil.

The soils types are represented by:

- Ah85 - red-yellow apedal, freely drained soils; red and yellow, high base status, usually <15% clay; and
- Ae252 – Red yellow apedal, freely drained soil; red, high base status, >300 mm deep (no dunes).

Land use

Previous land use activities included sludge irrigation activities. At present, the predominant land use in the wider area includes the existing MWWTP and open undeveloped grasslands to the eastern side where the expansion will take place.

There is also a residential area in close proximity to the project area.

Surface water

The surface water features in the area are located along the Sandloop, a tributary of the Mokolo River. The Water Management Area (WMA) in which the area falls is the Limpopo River WMA. From the DWA water use database, the main use of surface water in the area is irrigated agriculture. The registered annual water use volumes range from 10 360 m^3 to 540 000 m^3 in the area. Most of the water is abstracted from the Limpopo River which is the major water body in the area.

Flora

The area of the proposed development show similarities to Vegetation Type 17, namely the Sweet Bushveld, as described by Van Rooyen & Bredenkamp (In Low and Rebelo, 1996) and the Arid Sweet Bushveld (Veld Type 14) as described by Acocks (1988). The Sweet Bushveld and Arid Sweet Bushveld show similarities and correspond in vegetation composition, dominant trees, shrubs, climate and soils.

Fauna

Fauna occurring on site include assemblages within terrestrial and aquatic ecosystems: mammals, birds, reptiles, amphibians and invertebrates. Each of these assemblages occurs within unique habitats, the ecological state of these habitats directly relates to the number of species found within them. According to Carruthers (2007), the main habitats occurring in the region are bushveld plains, rivers and dams, with little altitudinal variation.

Public Participation Process

The Public Participation Process (PPP) was used to facilitate consultations with the Interested and Affected Parties (I&APs) in order to determine issues and concerns regarding the proposed project as well as to establish an effective working relationship with communities and authorities.

A community meeting for the local community members was held on 25 August 2012.

The following is a summary of the comments and issues that were raised by I&APs:

- The current water use at the existing MWWTP is of concern due to overcapacity;

- Management measures are required to ensure the protection of red data species, reptiles or other significant wildlife during the construction phases of the proposed MWWTP;
- The long-term maintenance of the MWWTP must be planned and properly managed including the sludge which may be generated from the construction of the MWWTP;
- Contract agreement signed by the LLM and Ledjadja Coal pertaining to the acquisition of the water;
- The involvement of the Department of Water Affairs (DWA) in accepting of the agreement signed by the above-mentioned parties;
- Concern raised that there is no licensed area for a landfill site and as such waste disposal has to be carefully considered;
- Construction timeframes for the MBET Projects; and
- The type of system to be used at the proposed MWWTP due to the sewage problem at the current Marapong Sewage Treatment facility.

ENVIRONMENTAL IMPACT ASSESSMENT

This EIA/EMP report has assessed the potential positive and negative impacts that the proposed project could have on the physical, biological and social environment.

According to the rated impacts, no highly significant negative impacts are expected to occur. The following potential negative impacts have been identified:

- Surface water flow or drainage may be impacted by the stockpiling of soil or the storage of building material;
- Increase in dust levels during construction phase;
- Loss of vegetation from the site; and
- Habitat availability and mortality on fauna species will occur.

The positive impacts that would arise from the proposed project are expected to have a medium – high significance based on the following:

- Termination of water pollution and subsequent improvement of environmental conditions through the upgrade of the wastewater treatment plant;
- Better use of water resource;
- Fast tracking of critical municipal infrastructure delivery (by private sector funding), which will allow faster delivery of housing and industrial developments, currently constrained by infrastructure;
- Through the decommissioning of the old plant, current visual impacts from the existing plants will be improved;
- MWWTP will be designed for zero effluent release;

- Effluent will be treated to a level which is suitable for use at the Boikarabelo Mine and will not be discharged into the stream, thus improving the downstream water quality conditions;
- Through the operation of the new plant, unpleasant odours from existing plant will improve the air quality for neighbouring residents;
- Ad hoc employment will be created during the construction phase; and
- Due to the current state of the fencing (providing access for pedestrians at some points), proper fencing will be provided to ensure that pedestrians won't hurt themselves and ensure that there will be no damage caused to the plant.

MANAGEMENT OF IDENTIFIED ENVIRONMENTAL IMPACTS

The EMP has been described according to the project activities in order to provide an understanding of what objectives are and what recommended management measures are required to mitigate impacts arising from these activities. To facilitate implementation and compliance auditing, the EMP has been separated into various project phases (i.e. construction and operational phase).

No major impacts are expected to arise from the proposed project. The proposed mitigation and management measures should be followed to ensure that this is the case.

ABBREVIATIONS

Acronym	Description
AIDS	Acquired Immune Deficiency Syndrome
BEE	Black Economic Empowerment
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
FET	Further Education and Training
HIA	Heritage Impact Assessment
HIV	Human Immune Virus
I&APs	Interested and Affected Parties
IHS	Initial Heritage Statement
IDP	Integrated Development Plan
IWULA	Integrated Water Use License Application
LEDET	Limpopo department of Economic Development, Environment and Tourism
LLM	Lephalale Local Municipality
masl	Meters above sea level
MBET	Marapong Boikarabelo Effluent Transfer
Ml/d	Mega litres per day
MRA	Mining Right Application

Acronym	Description
MWWTP	Marapong Wastewater Treatment Plant
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended
NEM:AQA	National Environmental Management Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:WA	National Environmental Management Waste Act, 2008 (Act No.59 of 2008)
NHRA	National Heritage Resource Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PAJA	Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000)
PPP	Public Participation Process
PRECIS	Pretoria Computerised Information System
REDs	Regional Electricity Distributors
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SAWS	South African Weather Service
SDF	Spatial Development Framework
SLP	Social and Labour Plan
STI	Sexually Transmitted Infections
ToR	Terms of Reference
WCW	Water Care Works
WMA	Water Management Area
WWTP	Wastewater Treatment Plant

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1 INTRODUCTION

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Ledjadja Coal (Pty) Ltd (Ledjadja Coal) requires additional water for the planned Boikarabelo Coal Mine and part of options considered included securing treated municipal effluent from the MWWTP and pumping it to the mine.

The LLM has signed an agreement with Ledjadja Coal, to assist in the upgrade of the Marapong Wastewater Treatment Plant (MWWTP) as part of the Marapong - Boikarabelo Effluent Transfer (MBET) project. The treated effluent will be pumped to Boikarabelo Coal Mine for use in mining operations.

The plant will be upgraded in two stages by constructing two 8 mega litres per day (Ml/d) wastewater treatment plant units and will expand to the eastern side of the project area. The MWWTP is situated in Marapong, on portions 2 and 3 of the farm Zongezien 467 LQ under the Lephalale Municipality in Limpopo Province, approximately 15 km north-west of the Lephalale (Plan 1- Regional Setting - Appendix A).

The development of the activated sludge wastewater treatment plant will require an Environmental Impact Assessment and an Environmental Management Programme (EIA/EMP) in terms of NEM:WA to obtain a Waste Licence.

A Water Use Licence (WUL) will be required in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA).

1.1 Regulatory Requirements

1.1.1 Applicable Legislation

The key legislation applicable to this project is as follows:

- National Water Act, 1998 (Act 36 of 1998) (NWA); and
- National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA).

A legal review of the listed activities in terms of the National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) was conducted and no activities were triggered by the proposed project.

1.1.2 National Water Act

Water resources in South Africa belong to the people of South Africa and regulated under the NWA. The Minister of Water Affairs is the custodian of all water resources in South Africa on behalf of the people of South Africa.

It must be noted that in terms of the NWA, it is an offence to pollute any water resources to render it unfit for the propagation of fish and aquatic life, including rainwater, seawater and subterranean water.

Ceenex Management Engineers (Ceenex) has been appointed to compile an Integrated Water Use License Application (IWULA) for the operation of the wastewater treatment plant. Upon request from the Department of Water Affairs (DWA), application forms were submitted to the Department to fast track the process. Additional studies in support of the application will be submitted in due course.

The following water use has been identified in terms of the NWA:

- Section 21 (a) - Taking water from a water resource; and
- Section 21 (g) - Disposing of waste or water containing waste in a manner which may detrimentally impact on a water source.

1.1.3 National Environmental Management Waste Act

Waste management activities requiring a waste management licence in accordance with section 20(b) of the National Environmental Management Waste Act are listed in GN R718 of 3 July 2009 No. 32368. These activities are separated into two categories namely Category A and B;

- Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA regulations supporting an application for a waste management licence; and
- Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA regulations supporting a waste management licence application.

A waste management license is therefore applied for in terms of the following activities (Table 1):

Table 1: NEM:WA Activities

Category & Activity	Description	Activity Description
Category A-Activity 7	The recycling of re- use of general waste of more than 10 tons per month.	The sludge will be dried, composted and re-used as soil conditioner for vegetation and rehabilitation of mine waste and closure.
Category A-Activity 19	The expansion of facilities or changes to existing facilities or any process or activity, which requires an amendment of an existing permit or license or a new permit or license in terms of legislation governing the release of	Lephalale Local Municipality (LLM) is in urgent need of increasing the size of its water care works (WCW) as it's currently substantially overloaded and effluent is

Category & Activity	Description	Activity Description
	pollution, effluent or waste.	discharged from the existing plant.
Category B-Activity 7	The treatment of effluent, wastewater or sewage with an annual throughput of 15 000 cubic meters or more.	The upgrade of the treatment plant (from 0.65 Ml/d to 16 Ml/d) which will involve the construction of an activated sludge wastewater treatment plant and sludge disposal facility to increase treated volumes of effluent.

1.1.4 Additional Applicable Legislation

Additional legislation applicable to the proposed project is listed below.

National and Provincial legislation and regulations:

- Limpopo Environmental Management Act, Act No.7 of 2003;
- National Heritage Resources Act, Act No. 25 of 1999;
- National Environment Management: Biodiversity Act, Act No. 10 of 2004; and
- Promotion of Access to Information Act, Act No. 2 of 2000.

Guideline Documents include:

- DWA: Best Practice Guideline G1: Storm Water Management;
- DWA: Best Practice Guideline GH: Water Reuse and Reclamation, June 2006;
- DWA: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities;
- South African Water Quality Guidelines – Aquatic Ecosystems, 1996;
- South African Water Quality Guidelines – Domestic Water Use, 2005; and
- Limpopo Internal Strategic Perspective, Department of Water Affairs and Forestry, 2004.

The Waterberg District Environmental Management Framework (Gazette No. 33306) document has been developed by the district authorities with the aim of regulating future developments within the area. The development of the proposed project will need to take into consideration areas that will be earmarked for various land use/development within management plans as well as social development projects.

1.2 Methodology for the EIA Process

The following process has been followed according to NEM:WA:

- Submission of an application for a waste license;

- Submission of an environmental scoping report; and
- Submission of an EIA/EMP report.

1.2.1 Submission of an Application for a Waste Licence

Application for a waste licence was submitted and acknowledged by the Department of Environmental Affairs (DEA) on 04 June 2012.

1.2.2 Scoping

The scoping phase served as an introduction to the project. It included a description of the proposed project, desktop studies regarding the different environmental aspects, explanation of the expected environmental impacts and the methodology that was used during the specialist studies. The Public Participation Process (PPP) was also initiated during this phase. The scoping report was submitted to the DEA on 28 September 2012 and was approved on 16 October 2012.

Investigations during the scoping phase included aspects such as the physical, biological and social environment and a general evaluation of the status of the MWWTP site. The information in the scoping report was compiled from various sources, including the client, site visits, literature reviews and documentation.

Both the preliminary positive and negative potential impacts that the proposed operations will have on the environment were identified and their relative significance discussed.

The PPP is central to the investigation of environmental impacts as it is important that stakeholders who are potentially affected by the project are given an opportunity to identify issues relevant to them and to ensure that local knowledge, needs and values are understood and utilised. Stakeholders were given the opportunity to review the Scoping Report from 16 July 2012 until 14 September 2012.

1.2.3 Environmental Impact Assessment

This EIA uses a numerical environmental significance rating process which is based on the accepted impact assessment methodology that uses the probability of an event occurring and the severity of the impact, should an event occur, as factors to determine the significance of a particular environmental risk.

In order to determine the severity of any potential environmental impact, the criteria that are taken into consideration are the spatial extent of the impact, the duration of the impact and the severity of the impact. The probability of an impact occurring is determined by the frequency at which the activity takes place and by how often the type of impact in question has taken place or takes place in similar circumstances. The values assigned to these factors (weighting) are discussed as part of the EIA.

The EIA assesses environmental and social impacts for different activities according to different stages of the proposed project, namely the construction and operational phases. Impact and benefit significance are assessed before and after the application of any

mitigation or enhancement measures and refer to effects on both the ecological and social environment.

In addition, the cumulative impacts of the proposed operation on the environment, with reference to similar operations and activities in the area are discussed.

1.2.4 Environmental Management Programme

The EMP addresses all environmental impacts that have been identified in the EIA phase and provides achievable mitigation measures to reduce the possible impacts on the environment.

The EMP section is divided into the setting of objectives and the provision of management measures. The monitoring and performance assessment section of the EMP details the monitoring and audits that will be implemented to ensure the effectiveness of mitigation measures.

1.3 Government Departments Involved

The following governments departments will be involved during the decision making process:

- Department of Environmental Affairs
  - Competent authority for authorising the Waste License Application.
- Department of Water Affairs (Polokwane Regional Offices)
  - Competent authority for authorising the Water Use Licence Application.

1.4 Qualification of Consultant

Digby Wells is an independent environmental solutions provider. The personnel of Digby Wells are qualified and competent within their field of expertise and where required junior consultants are guided and mentored by senior and experienced personnel. Suitably qualified sub-contractors are used, where necessary, in order to ensure that all requirements for the establishment of baseline environmental information are reported on.

For the purpose of this project the following Digby Wells specialists are involved:

- Andries Wilke – Project Sponsor;
- Louise Nicolai – Project Manager;
- Naledi Moeketsi – Project Administrator/EAP;
- Natasha Higgit – Heritage Impact Assessment;
- Andrew Pirie – GIS Specialist;
- Louise van Wyk – Fauna and Flora; and
- Lerato Ratsoenyane – Public Consultation.

The curriculum vitae have attached in Appendix B.

2 PROJECT DESCRIPTION

2.1 Project Background

The upgrade of the treatment plant will involve the construction of an activated sludge wastewater treatment plant covering an area of 15.33 ha.

The current situation at the existing MWWTP was assessed by Ceenex with regards to current supply and demand and it was found that the current flow and loading to the system exceeds the installed capacity. The installed capacity is 0.65 Ml/d and the current measured flow and load is 3.1 Ml/d. This is resulting in the discharge of partially treated effluent water into the river system. Several preliminary infrastructure designs for the proposed wastewater treatment plant were done, using South African standards and design criteria. The preliminary designs included the upgrade of the municipal effluent system as well as a water transfer system to the mine.

The pre-feasibility design covered a large range of activities, including:

- Establishment of design criteria;
- Determination of design assumptions;
- Determination of flow and organic load from every candidate option;
- Design at- pre-feasibility level bulk sewers and bulk sewage pump stations;
- Selection and design of appropriate Water Care Works (WCW) installed capacity;
- Geographic alignment and routing of water transfer system and site inspections;
- Determination of static and dynamic head for transfer pump stations;
- Compilation of specifications and schedule of quantities; and
- The design of a total cost of ownership economic model that has optimisation capabilities.

In line with the signed agreement, Ledjadja Coal will provide the following as part of the MBET project:

- Financing;
- Planning;
- Licensing;
- Design;
- Construction;
- Testing;
- Commissioning;
- Short term operation and maintenance;

- Training of municipal staff; and
- Handover to the LLM of a 16 Ml/d activated sludge municipal wastewater treatment plant one year after completion of the second 8 Ml/d treatment unit.

The proposed extended aeration activated sludge plant will have two reactor compartments comprising anoxic and aerobic zones. The purpose of the aerobic zone is to remove the carbon based organic materials by using aerobic bacteria and oxygen addition. The ammonia in the sewage will be oxidised using oxygen and nitrifying bacteria in a two-step process, converting the ammonia to nitrites and then to nitrates. The purpose of the anoxic zone is to allow the reduction of the nitrates to nitrogen gas using bacteria that grows in the absence of oxygen.

The new cells formed as well as the dead cells in the reaction are separated from the liquid stream in the form of a flocculent sludge in settling tanks also referred to as clarifiers and then re-circulated using a specific recirculation ratio to ensure optimal biomass growth and settling properties. In order to maintain a healthy and balanced activated sludge culture, the activated sludge is maintained at a design sludge age of about 20 days. This requires one twentieth of the volume of the reactor to be wasted daily in the form of waste activated sludge.

It is proposed that the waste activated sludge be transferred to a sludge maturation pond in order to increase the sludge age before it is pumped to a sludge dewatering unit. The stabilised, nuisance free, dried sludge will then be placed on a composting slab, where it will be turned into compost for use as a conditioning agent for mine rehabilitation.

The clarified treated effluent, free of suspended solids and organic materials will then be disinfected to oxidise all remaining bacteria and pumped to the mine for use in its production processes.

The proposed treatment process will be the extended biological nitrogen removal aeration schematically presented in Figure 1 Figure 1below.

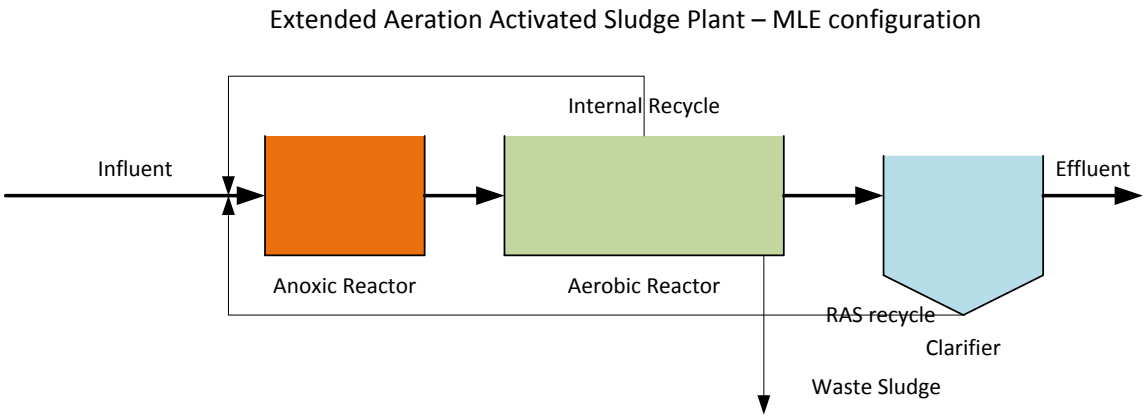

Figure 1: Typical Nutrient Removal Activated Sludge Treatment Plant

The new cells formed in the reaction are removed from the liquid stream in the form of a flocculent sludge in settling tanks. A part of this settled biomass, described as activated sludge is returned to the aeration tank and the remaining forms waste and excess sludge.

The remaining sludge will be dried, composted and re-used as soil conditioner for vegetation and rehabilitation of mine waste and closure. This technology integrates into the treatment system, processes the sludge liquids and recovers phosphorus and other nutrients -- and then converts them into a high-quality commercial fertilizer. The sludge to compost circuit will include (Appendix C – Engineering Designs):

- A sludge pump;
- Storage slab;
- Volute dehydrator;
- Slab for composting;
- Compost heap;
- Filtrate channel;
- Seepage and drainage channel;
- Drain pipe to dividing box; and
- Dehydrator building.

The proposed MWWTP has been presented graphically in Figure 2 below.

Detailed engineering designs for the MWWTP have been attached as Appendix C.

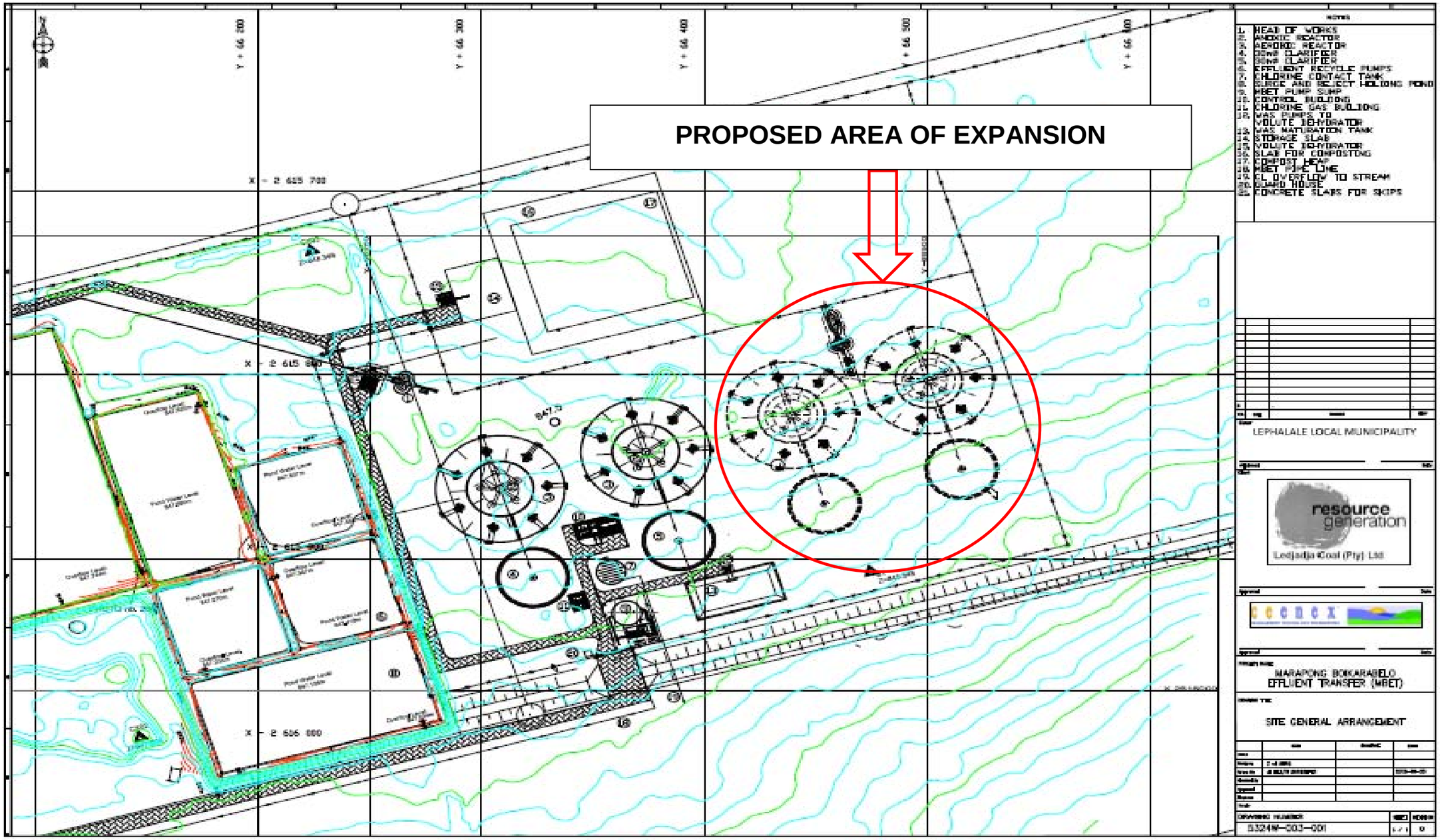

Figure 2: MWWTP Site General Arrangement

The MWWTP treated effluent will be pumped to the proposed Boikarabelo Coal Mine and the treated effluent will be transported via a proposed 58 km long pipeline which will have 3 m servitude. A separate study was undertaken for the pipeline and authorisation has been received from the Limpopo department of Economic development Environment and Tourism (LEDET).

Plan 1 (Appendix A) indicates the location of the proposed water transfer system from the MWWTP to the proposed Boikarabelo Coal Mine. The pipe servitude will mainly be aligned with the existing infrastructure as well as the proposed railway line to the Boikarabelo Coal Mine.

2.2 Location & Site Description

2.2.1 Regional Setting

The study area falls within the LLM in the Marapong area on the farm Zongezien 467 LQ in the Limpopo Province. The owner of the property is the LLM.

A tributary of the Mokolo River (Sandloop) is located approximately 2.5 km north east from the MWWTP and the Grootegeluk Mine is situated 15 km south west from the site (Plan 1 - Appendix A).

2.2.2 Property Particulars

Details on land ownership are provided in Table 2 and Table 3 below (See also Plan 2).

Table 2: Landownership Details

Farm Name	Landowner	Title Deed number
Zongezien 467 LQ – Portion 2	Lephalale Local Municipality	T12478/1995
Zongezien 467 LQ – Portion 3	Lephalale Local Municipality	T12478/1995

Table 3: Adjacent Landownership Details

Farm Name	Landowner	Title Deed number
Zongezien 467 LQ- Portion RE	Eskom Holding (Pty) Ltd	T15341/1982
Zongezien 467 LQ – Portion 1	Loots Marthienus Frederick	T61932/1993

2.2.3 Direction & Distance to Neighbouring Towns

Table 4 below lists the MWWTP's direction and distance from neighbouring towns.

Table 4: Direction and Distance to Neighbouring Towns

Town	Distance (km)	Direction
Lephalale	10 km	East
Onverwacht	7 km	South - east

2.2.4 Surface Infrastructure

At present there is an existing sewage treatment plant (belonging to the LLM) on portion 2 of the farm Zongesien 467 LQ. No other infrastructure exists at the proposed plant location.

2.2.5 Employment

During the construction phase of the plant, ad hoc employment will be created and unskilled labour will be sourced locally. It is envisaged that a local contractor, utilising local labour, will be appointed for the earthworks and some civil construction of the expansion to the MWWTP. The permanent labour at the MWWTP force post construction is not expected to increase to 20 staff.

2.3 Project Motivation

An extensive assessment of the status quo was conducted and included the following:

- LLM currently operates the MWWTP with a design capacity of 0.65 Ml/d and the current flow and load is equivalent to 2.5 Ml/d;
- Due to flat topography (which has a direct effect on the number of lift pumps and therefore on electric energy consumption), uncontrolled development and insufficient capacity of the treatment plant, the LLM is burdened with far too many households to service versus service and design capacity;
- The treated effluent from the MWWTP does not comply with the regulatory requirements and is polluting the environment (Figure 3) through the discharge of partially treated effluent water; and
- Evidence of new developments is all over and planning documents predicts high growth in housing developments. Additional capacity is required to be able to meet this demand.

Discharge to the nearest stream

Evidence of malfunctions

Overflow from existing ponds

Effluent from plant discharged to ponds

Figure 3: Environmental Degradation Caused by the Existing MWWTP

2.4 Benefits of the Project

The following will form part of project benefits:

- Termination of water pollution and subsequent improvement of environmental conditions through the upgrade of the MWWTP;
- Saving of capital expenditure by the municipality for building of sewerage services to the equivalent of a 16 Ml/d wastewater treatment plant;
- Fast tracking of critical municipal infrastructure delivery, which will allow faster delivery of housing and industrial developments when compared to the existing planning;
- Creating of additional employment as a result of urban development;

- Effluent will be treated to a level which is suitable for use at the Boikarabelo Mine and will not be discharged into the stream, thus improving the downstream water quality conditions;
- The construction of the 16 Ml/d wastewater treatment plant will create additional temporary employment during construction;
- Establishment of a local Black Economic Empowerment (BEE) subcontractor sludge and composting plant operator that will be trained to operate the wastewater treatment plant; and
- Without the treated effluent, the Boikarabelo Coal Mine will not be able to full operation. The mine will create about 800 direct jobs and earn foreign income for South Africa.

2.5 Consideration of Project Alternatives

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives help identify the most appropriate method of developing the project, taking into account location or site alternatives or the no-go alternative. Alternatives also help identify the activity with the least environmental impacts.

2.5.1 Site Location Alternatives

The selected option, yielding the lowest total cost of ownership for the LLM would be to provide for one treatment facility, at the existing MWWTP site instead of doubling of the current infrastructure with an identical expansion.

The following project alternatives were considered:

- The second best option for the LLM would be to construct a brand new facility at an alternative site located at R510 and Vogelstruisfontein;
- Another alternative for the LLM will be to keep the existing plant at Marapong open and do all future extensions at Paarl, however this would not be economically viabledue to financial constraints; and
- In addition, other technology options were also considered including single batch reactor units, high rate clarification, attached growth options and combined attached growth and suspended growth reactors, with and without chemical treatment. Taking into account the project objectives, the proposed biological nutrient removal activated sludge plant provided the best long term sustainable solution.

2.5.2 No-go Alternative

The no-go alternative is the option of not upgrading the MWWTP. Should the upgrade of the MWWTP not continue the following will be impacts:

- Contamination of the nearest surface water streams will continue as the water will not be treated to the required quality;
- Bad odours emanating from the existing plant will continue;
- Boikarabelo coal mine will not be able to operate at full capacity;
- Boikarabelo coal mine will have to source alternative water supplies, this would probably be water of a potable quality which will reduce water availability for other users; and
- The urban and industrial development of Lephalale will be delayed, or halted until expanded facilities are constructed.

3 PUBLIC PARTICIPATION PROCESS

A detailed PPP Report has been attached as Appendix D.

Public participation in environmental authorisation processes is not only a statutory requirement in terms of South Africa legislation, but a process that should lead to a joint effort between the applicant and I&APs. The principles that demand communication with society at large are best embodied in the principles of NEMA, Chapter 1, South Africa's overarching environmental law. In addition, Section 24 (5) and regulation 54-57 of GNR 543 in terms of the NEMA EIA 2010 Regulations and Section 47 (2) (3) (4) of NEM:WA guides the PPP that is required for an EIA process.

The PPP for the proposed project has been designed to comply with the requirements laid down in the above legislation and guidelines as well as other applicable Acts such as the NWA (Section 27) and the Department of Environmental Affairs (2010), Public Participation 2010; Integrated Environmental Management Guideline Series 7 has also been taken into consideration.

3.1.1 Objectives of Public Participation in the EIA Phase

The objectives of the PPP for the Scoping phase were to provide sufficient and accessible information to I&APs in an objective manner so as to:

- Provide a platform for I&APs to identify issues of concern, express their thoughts and provide suggestions for enhanced benefits to the project planning and design;
- Share their valuable local knowledge and experience; and
- Ensure that the issues identified are considered in order to help define the scope of the technical studies to be undertaken during the Impact Assessment phase.

The specific objectives of the PPP for the EIA phase are to:

- Verify that the issues raised by I&APs have been addressed in the specialists environmental investigations conducted for the project;

- Provide feedback and the outcome of potential impacts of the proposed development from the environmental investigations;
- Present the mitigation measures and managements plans developed to address the potential impacts identified; and
- Provide further opportunity for registered I&APs to comment on the Draft and Final EIA and EMP in order to suggest ways reduce or mitigate negative impacts and enhance positive impacts.

The key objective of the PPP is to ensure transparency and accountability throughout the process and to promote informed decision making through collaboration from all affected and interested groups.

3.1.2 Approach to be Adopted for the PPP

I&APs should represent all relevant interests and sectors of society, technical specialists and the various relevant organs of state that work together to produce better decisions than if they had acted independently.

A collaborative PPP approach has been adopted for the proposed project. This will ensure that comments and issues raised by I&APs and the relevant authorities are included in the project planning and design, and that clarity is provided to the degree to which I&APs are willing to accept or live with the impacts associated with the development.

The following section of the report summarises the methodology which has been employed for the PPP during the Scoping phase and the activities to date for the Impact Assessment phase.

3.1.3 Public Participation Methodology

3.1.3.1 Identification and Profiling of Interested and Affected Parties

To ensure proper representation of all I&APs, the following identification methods were used for the updating of the I&APs database:

- Conducting Windeed searches around the project footprint within a radius of between 100 metres and 2 kilometres to verify landownership and obtain contact details of the directly affected and surrounding landowners;
- Responses on the distribution of the Background Information Document (BID) with Registration and Reply Sheet;
- Responses received from the publication of newspaper advertisements in the local newspaper, namely the Northern News Bulletin;
- Responses on the placement of site notices on-site and at strategic public areas;
- Issues and comments received from the Community Meeting held at Marapong and during the one-on-one consultation meetings with potentially affected landowners.

The identification and recording of I&APs details has been and will be on-going throughout the EIA process. The identification of key I&APs and community representatives for this project has been important as their contributions have been valuable.

All I&AP's previously listed on existing databases and registered I&APs details have been captured on Maximiser 12, an electronic database management software programme that automatically categorises all electronic correspondence to stakeholders, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from I&APs are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations under Section 24(5) of NEMA, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of involved and registered I&APs throughout the process (See Appendix D-1 for the copy of the I&AP Database).

Two main I&AP groups were identified and categorised as such, namely 1) Regulatory Authorities and 2) Public.

- Relevant authorities from national, provincial, district to local authorities were identified as these form part of the project decision-making process and need to be appropriately informed of project developments that have a potential to influence the local economies; and
- The Public which has been categorised according to their level of participation and are crucial to the project as they provide input into the environmental investigations for better project planning and design; thereby, influencing the decision-making process. Refer to Table 5 below for the categorisation of identified and recorded I&APs.

To date, 5 I&APs have been recorded on the database.

Table 5: Identified and Recorded I&APs

Group	Influence	Authority	Level of Participation
Regulatory Authorities	National	Department of Environmental Affairs (DEA); and	Competent authority
		South African Heritage Resources Agency (SAHRA).	Commenting authority
	Provincial	Department of Water Affairs (DWA), Limpopo; Department of Mineral Resources (DMR), Limpopo; Department of Agriculture (DO),	Commenting authorities

Group	Influence	Authority	Level of Participation
		Limpopo; Department: Rural Development and Land Reform, Limpopo (DRDLR); Department: Public Works, Limpopo (DPW); Department of Health and Social Development, Limpopo (DHSD); Limpopo Department of Economic Development, Environment and Tourism (LEDET); and Limpopo Department of Roads & Transport (LDRT).	
	Local	Waterberg District Municipality (including all relevant Divisions within the District)	Commenting authorities
		Lephalale Local Municipality (including all relevant Divisions within the Municipality)	
Public	Parastatals	Transnet Freight Rail; Eskom Holdings (Pty) Ltd; Roads Agency Limpopo (RAL); Trans-Caledon Tunnel Authority (TCTA); and Telkom.	Directly and surrounding landowners
	Landowners	Zongezien 467 LQ (Portion 1) - Mr Frederick Marthienus Loots; and Eendracht 505 LQ – Mr Johannes Jurgens Lamprecht	Adjacent farm landowners

Group	Influence	Authority	Level of Participation
	Mining	Anglo American Thermal Coal South Africa; Exxaro Coal (Pty) Ltd; Sasol {Sasol Mining (Pty) Ltd, Sasol Mafutha (Pty) Ltd and Sasol Mining Mafutha (Pty) Ltd}; Sekoko Resources (Pty) Ltd; and Temo Coal Mining (Pty) Ltd.	Surrounding landowners and local players
	Community and political based organisations	Marapong and Lephalale	Local community
	Key environmental, residential, and legal groups	Agri SA – Lephalale; Lephalale Development Forum; Steenbokpan Development Consortium; Lesedi Village Steering Committee; and Duard Barnard Attorneys; LVP Attorneys.	Local

3.1.3.2 Announcement of Opportunity to Become Involved

The opportunity to participate in the EIA PPP was announced on 10 July 2012 as follows:

- The distribution of a Background Information Document (BID) to inform relevant authorities, potentially affected landowners and the general public about the project, the location of the project, specialist studies to be conducted, legislative and public participation processes applicable to the project as well as notification regarding the dates of when the Draft Scoping Report was available for public review and comment and the community meeting held in August 2012 were included. The BID was also hand-delivered and distributed to surrounding farm landowners, at public places in Steenbokpan, Marapong and Lephalale and to environmental groups and other interested parties on 16 - 17 July 2012. (Refer to Appendix D- 2 for documentation developed);
- Newspaper advertisements (Appendix D-3) were placed in the following newspapers presented in Table 6 below:

Table 6: Newspaper Advertisements Published

Publication	Date
Northern News Bushveld Bulletin Local Newspaper	Friday, 13 July 2012

- Site Notices were positioned on-site and at various public places at Marapong and Lephalale on 16 - 17 July 2012. Site notices were placed to invite I&APs to participate in the project and to inform them of the Community Meeting. The site notices were placed at the following public areas:

3.1.3.2.1 <u>On-site</u>

- Lephalale Local Municipality Wastewater Treatment Plant site - Main offices;
- Marapong Community Library - Notice board;
- SAVF 1 Stop Community Library - Outside main entrance; and
- SPAR Marapong - outside the Spar building window.

3.1.3.2.2 <u>Other alternative sites</u>

- D1675 & D2816 - Along the intersection of the provincial roads;
- AGRI SA Lephalale - At the entrance wall;
- Lephalale Local Municipality - Reception notice board; and
- Lephalale Local Municipality Public Library - Outside notice wall.

Refer to Appendix D-4 for the Site Notice Report with photographic evidence of where the notices were placed.

3.1.3.3 Obtaining Comments and Contributions during the Scoping Phase

The following opportunities were made available during the Scoping phase for contribution from I&APs:

- Completing and returning the registration/reply sheet in which space is provided for comment (included in the BID);
- Providing comment telephonically or by email to the public participation officer;
- Notification letter distributed - calling for comments on the Draft and Final Scoping Report;
- A community meeting which was held on Saturday, 25 August 2012 at Marapong. Relevant authorities and I&APs were notified of the meeting through the BID distribution, site notice and newspaper publications as well as through the distribution of the notification letter calling for comments on the Draft Scoping Report; and
- Comments received during one-on-one consultations held with the following private landowners:
  - Roads Agency Limpopo - 10 September 2012;
  - Exxaro Coal (Pty) Ltd - 11 September 2012;
  - Sasol Mining (Pty) Ltd - 12 September 2012;
  - Trans-Caledon Tunnel Authority - 13 September 2012;
  - Eskom Holdings Ltd - 14 September 2012;
  - Mokolo Water Users Association - 18 September 2012;
  - Batis Prop (Pty) Ltd and Waterkoof Familie Trust. The main contact person is Mr Hendrik Pieterse - 01 October 2012;
  - Zongezien 467 LQ - Mr Frederick Marthienus Loots - 02 October 2012; and
  - Eendracht 505 LQ - Mr Johannes Jurgens Lamprecht - 02 October 2012.

Please refer to Appendix D-5 for copies of the minutes from all the consultation meetings held.

3.1.3.4 Draft and Final Scoping Reports for Public Review

The Draft and Final Scoping Reports were compiled for consideration by the relevant authorities and the public.

The Draft Scoping Report was made available for a period of 60 days from 16 July 2012 to 14 September 2012. The report was made available at the following locations as seen on Table 7. The Final Scoping Report was made available for a period of 21 days from 23

October 2012 until 12 November 2012. The Final Scoping Report was placed only at the LLM's Public Library and at Marapong Community Library.

Table 7: Public Locations for Draft Scoping Reports for Public Review and Comment

Person	Location	Contact
Printed Copies		
Lephalale Local Municipality Public Library	Corner Joe and Douwater Avenue Onverwacht Lephalale 0555	Ms Hazel Mashaba (Head Librarian) Tel: (014) 762 1453 Opening Hours weekdays: 09:00-17:30 Saturday: 09:00 – 12:30
Ceenex Management, Technology & Engineering	374 Rigel Avenue South Erasmusrand City of Tshwane 0181 South Africa	Mr Johan Wagner (Project Manager) Tel: (012) 347 2620 Office Hours weekdays: 09:00 – 16:00 Website: www.ceenex.com
Marapong Community Library	1456 Setlhora Street (close to Marapong traffic circle) Marapong 0556	Mr Sophonia Petja (Librarian) Tel: (014) 768 3927 Opening Hours weekdays: 07:30 – 17:30 Saturday: 08:30 – 12:30
Ledjadja Coal	Unit 2, Carrera House, 19 Sovereign Drive, Route 21 Corporate Office Park, Irene 0157 South Africa	Mr Thomas Tau (Manager: Regulatory Compliance and Empowerment) or Mr Hennie van der Aardweg (General Manager) Tel: (012) 345 1057 Office Hours weekdays: 08:00-16:30

Person	Location	Contact
Printed Copies		
AGRI SA, Lephalale	Albert Street NTK Lephalale 0555	Mr Francois van der Berg (Chairman) Tel: (014) 763 1888 Office Hours Monday to Thursday – 07:30 – 13:00 Friday: 07:30 – 12:00
Lesedi Village	Steenbokpan (Ward 3)	Councillor Frans Magwai Cell: (079) 342 2282 Weekdays and Saturday: 10:00 – 18:00
Electronic Copies		
Ms Lerato Ratsoenyane	www.digbywells.com under Resources: Public Documents	Tel: (011) 789 9495
	An electronic copy (CD) on request.	Email: lerato@digbywells.com

3.1.3.5 Community Meeting

A Community Meeting was held to exchange information with the community of Marapong, provide a platform for raising concerns and issues, and share knowledge about the proposed development of the MWWTP. Please refer to Appendix D-5 for copies of the minutes.

3.1.4 Public Participation Activities in the Impact Assessment Phase

3.1.4.1 Announcing the Availability of the Draft EIA and EMP

The NEMA Guidelines specify that stakeholders must have the opportunity to verify that their issues have been captured and assessed before the EIA is approved. The findings of the specialist assessments have been integrated into this report. The Draft EIA/EMP has been compiled and has been submitted to DEA on 12 December 2012. The report will be made available for a period of 60 days from 03 January 2013 to 04 March 2013.

A notification letter will be circulated to all registered I&APs, informing them of the availability of the report for comment. The report will be made available at the Lephalale and Marapong Public Libraries.

3.1.4.2 Final EIA and EMP

After comments from I&APs have been incorporated, all stakeholders on the database will receive a notification letter to report on the project status, to thank those who commented to date and to inform them of the availability of the Final EIA and EMP for review and comment.

3.1.5 Comments and Response Report and Acknowledgements

The issues and comments raised during the Scoping phase of the project have been captured in a Comments and Response Report (CRR) appended to the Draft EIA as Appendix D-6.

The following is a summary of the comments and issues were raised by I&APs:

- The current water use at the existing MWWTP is of concern due to the design not being able to cope with the current demand;
- Management measures are required to ensure the protection of red data species, reptiles or other significant wildlife during the construction phases of the proposed MWWTP;
- The long-term maintenance of the MWWTP must be planned and properly managed including the sludge which may be generated from the construction of the MWWTP;
- Contract agreement signed by the LLM and Ledjadja Coal pertaining to the acquiring of the water;
- The involvement of the Department of Water Affairs in accepting of the agreement signed by the above-mentioned parties;
- Concern raised that there is no licensed area for a landfill site for the town and as such waste disposal has to be carefully considered;
- Construction timeframes for the MBET Projects; and
- The type of system to be used at the proposed MWWTP due to the sewage problem at the current Marapong Sewage Treatment facility.

3.1.5.1 Announce Authorities' Decision on Environmental Authorisation

Should the DEA accept the Final EIA and EMP Report, they will issue an Environmental Authorisation (EA) in terms of NEM:WA. Notification will then have to be made to all registered I&APs on the outcome of the decision, the reasons for the decision and the appeal process to be followed.

- The EA will be made public through the publication of a newspaper advert in at least one local newspaper; and

- Notification letters regarding the EA will be distributed to all registered I&APs.

4 DESCRIPTION OF AFFECTED ENVIRONMENT

4.1 Physical Features and Characteristics

4.1.1 Geology

The proposed project area falls within the Karoo Super group (Plan 3), where the southern part falls within the Kransberg Sub-group and Waterberg Super group.

The northern part falls within the Clarens Formation and Karoo Super group.

The underlying geology to consist mainly of sandstone, siltstone and shale.

Other geologic formations within the vicinity of the project area include the Letaba and Linsbon formations.

4.1.2 Climate

Climatic data for the period 1998 to 2012 was sourced from the Eskom substation for Marapong and is summarised below.

4.1.2.1 Rainfall

The average monthly rainfall was recorded at the Eskom station, for the period 2008 – November 2011 as shown in Figure 4 below. The rainy season is shown to be intensive between the months of August and November with the highest occurring in August 2011 at 175.01 mm.

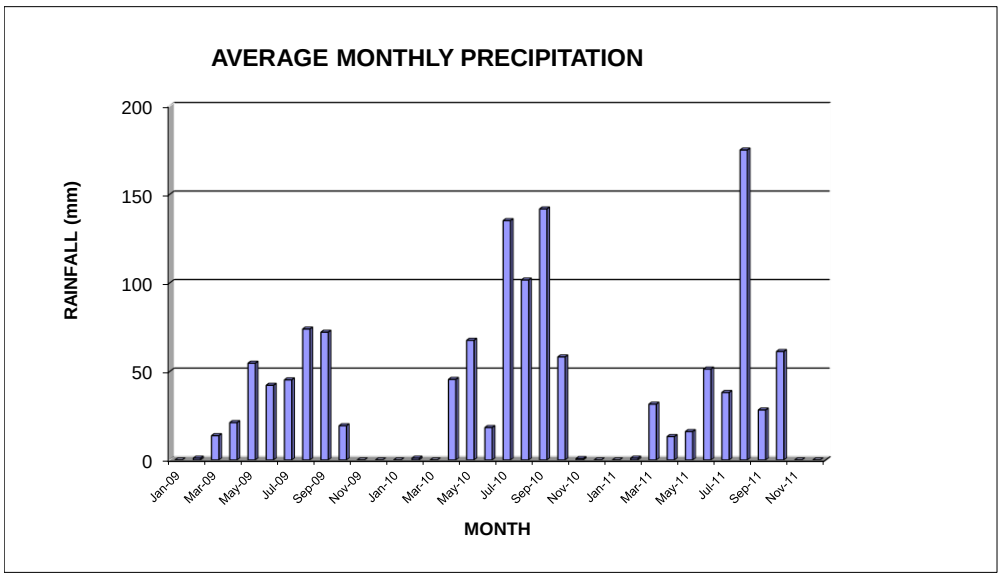

Figure 4: Average Monthly Precipitation 2008 -2011 (Source: Eskom Substation in Marapong)

4.1.2.2 Temperatures

Figure 5 below represents average monthly temperatures from September 2003 to September 2012. The maximum temperatures ranged just above 25^{0}C.

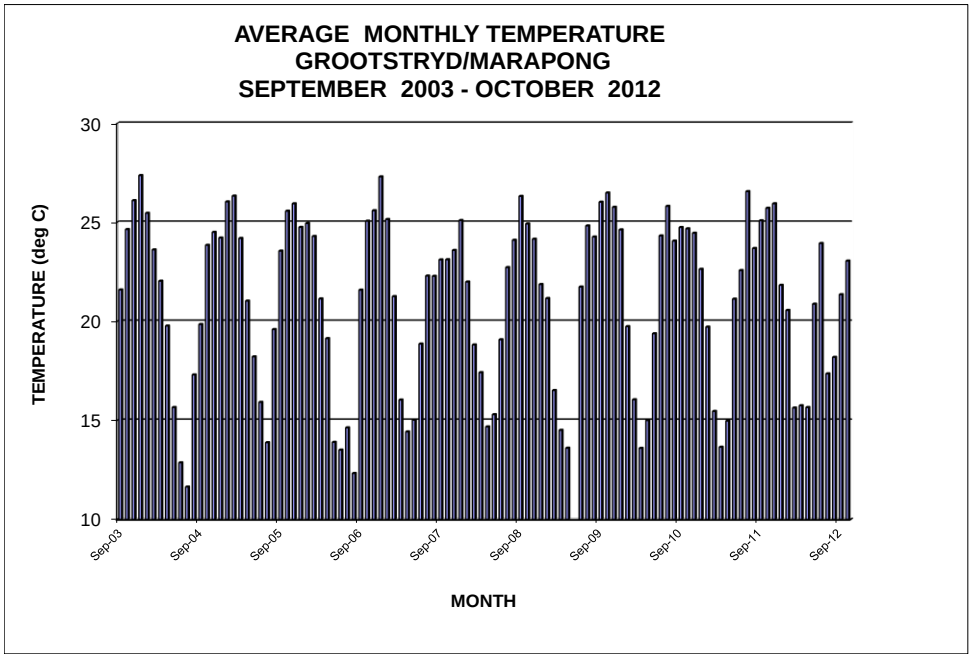

Figure 5: Average monthly temperature Grootstryd/Marapong September 2003 to October 2012 (Source: Eskom Substation in Marapong)

4.1.2.3 Mean Monthly Wind Direction and Speed

Wind data was obtained from the Eskom Substation in Marapong for the period 20 January 2005 to 31 October 2012. The wind direction has a significant northerly component shifting between North-east and South- east. Stormy conditions do not usually occur (Figure 6).

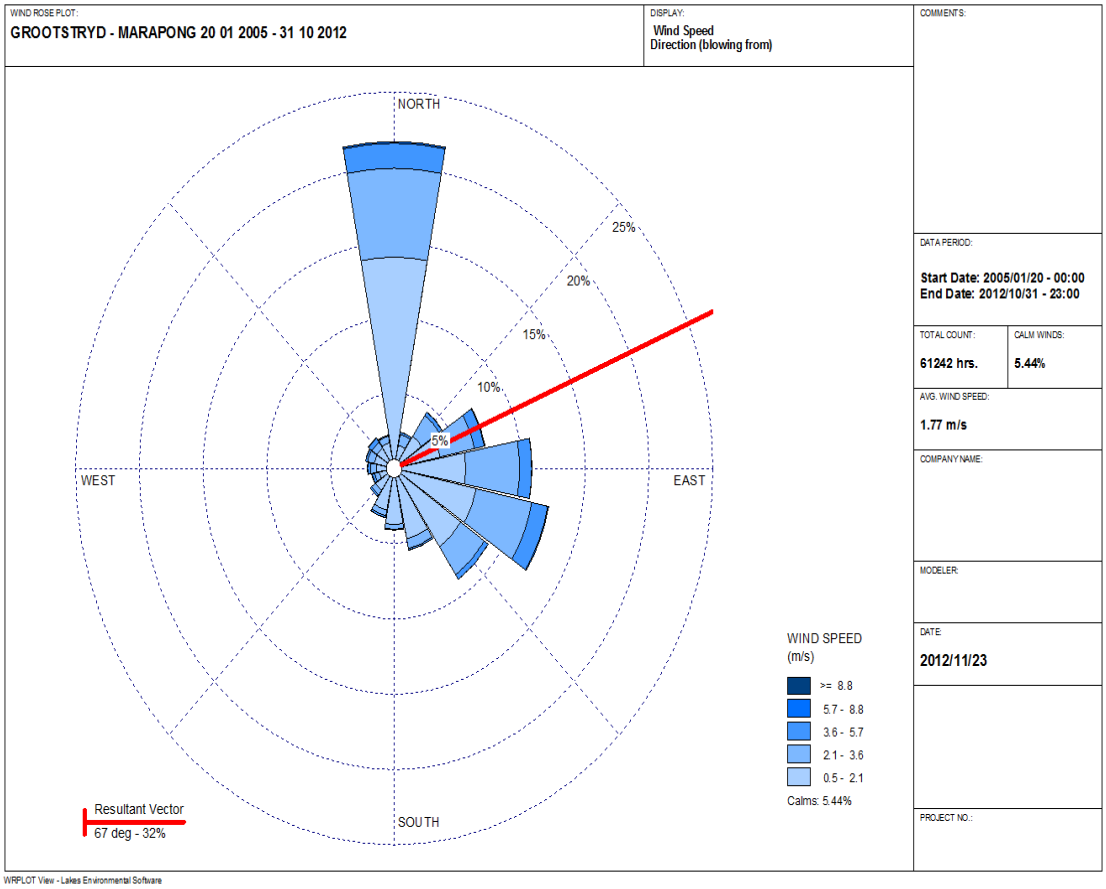

Figure 6: Wind Speed Direction from 2005 – 2012 Grootstryd/Marapong

4.1.3 Topography

Topography is defined as the study of the earth's surface features and involves local detail, including features such as the relief of the surface, vegetation cover and human activities. The topography has a strong relationship with the underlying geology and climate; thus there is a strong link between topography and the science of geomorphology.

As can be seen in Plan 4 the proposed project sites topography is flat and is located at an altitude of between 833 to 854 meters above sea level (masl) and there are a few non perennial streams.

4.1.4 Soil and Land Capability

The land type Bc44 is dominant in the project area. This land types can contain well drained red and yellow soil in the upland positions, but may contain water logged soil in lowland and valley bottom positions.

Soils at the proposed project area are represented by Plinthic catena: eutrophic; red soils widespread, upland duplex and margalitic soils rare.

Surrounding land types are represented by Ah85 and Ae252.

The Ah land type contains red well drained high base status soils. The Hutton soil form is well represented in this land type. The soils are non-structured and the A horizon contains 6 – 12% clay. Soil texture represents a sandy loamy textured soil.

The Ae land type contains red well drained low base status soils. The Hutton soil form is well represented in this land type. The soils are non-structured and the A horizon contains 6 – 12% clay. Soil texture represents a sandy loamy textured soil.

The soils types are represented by:

- Ah85 - red-yellow apedal, freely drained soils; red and yellow, high base status, usually <15% clay; and
- Ae252 – Red yellow apedal, freely drained soil; red, high base status, >300 mm deep (no dunes).

4.1.5 Land Use

Previous land use activities included sludge irrigation activities. At present, the predominant land use in the wider area includes the existing MWWTP and open undeveloped grasslands to the eastern side where the expansion will take place (Plan 6).

There is also a residential area in close proximity to the project area.

4.1.6 Surface Water

4.1.6.1 Catchment Characterisation

The proposed project area falls within the A42J quaternary catchment. The area is located along the tributary of the Mokolo River named Sandloop. The Water Management Area (WMA) in which the area falls is the WMA 1 - Limpopo (Plan 7) where the major rivers include the Limpopo, Mokolo, Sandloop and Rietspruit.

4.1.6.2 Water Uses

According to the DWA water use database, the main use of water in the catchment area is for agricultural irrigation, with annual volumes ranging from 10 360 to 540 000 m^3 being abstracted. There are no significant dams, and a significant quantity of the water use is from groundwater (DWAF, 2004). Most of these abstractions occur on the Limpopo River, as it is the major water resources in the catchment area.

Water uses on the project site will be mainly used to treat the effluent.

4.1.7 Groundwater

The following groundwater-related baseline conditions around the region have been reviewed through the following desktop investigations:

Certain stratigraphic units within the Waterberg coalfield, as a result of their composition and predominant lithologies, have the potential for the storage and passage of groundwater due to their lithological makeup. This potential has been further enhanced or contained as a result of the faulting and jointing interpreted in this field.

The northern compartment is underlain by the Stromsberg, Beaufort, Ecca, Dwyka and Waterberg groups. The basalts are fractured and weathering occurs between successive lava flows. The lower contact between the Letaba formation and the Clarens formation is an erosion surface which also has considerable hydrogeological significance.

4.1.8 Air Quality

In October 2010, the DEA revised the National Environmental Management Air Quality Act, 2004 (Act 39 0f 2004) (NEM:AQA), the Waterberg Area was declared a priority area.

Major pollution sources in the Waterberg include:

- Power generation;
- Mining;
- Industrial sources; and
- Domestic fuel burning

Apart from these already existing sources there are also a number of future developments that may have an impact on the local air quality. These sources include the following power stations:

- Medupi (4800MW);
- Matimba Power station (3990MW);
- Mmamabula (1 200MW);
- Mookane (300MW);
- Moropule (132MW + 600MW x 2 in the near future); and
- Boikarabelo Power Station (260MW).

It is expected that the current levels of dust fallout in the region are low during summer but increases during the winter months; due to a generally drier atmosphere and strong winds. It is expected that the vehicular activity on the dirt roads impacts on the ambient dust levels but it is of a low significance, due to the low frequency of the vehicular traffic on the dirt roads. The air quality in the area is also impacted on by the occasional veld fires during winter months. Concerning ambient air quality, no sources of air pollution, dust fallout or

other emissions exist in the immediate area surrounding the proposed site that impact on the relevant sensitive receptors.

4.1.9 Noise

The current WMTP is situated within a residential area and does not have a significant impact on the noise in the area.

4.2 Biological Features and Characteristics

A detailed Fauna and Flora study has been attached as Appendix E.

4.2.1 Vegetation

The proposed MWWTP is planned to be developed in an already disturbed area and is adjacent to an existing treatment plant. The level of disturbance could be noted by the growth of secondary grass and the level of exotics present on site. Two communities were differentiated.

Combretum apiculatum Bushveld community: This community had a moderate grass layer but a dominant tree and shrub layer. Dominant trees and shrubs of this community include Combretum apiculatum; Combretum heroense; Boscia albitrunca; Acacia burkei; Terminalia sericea and Grewia flava. There were signs of human disturbance. This vegetation community can be seen in Figure 7.

Eragrostis/Digitaria Bushveld Grass community 2: There were no trees within this community. It was dominated by small shrubs, grasses and exotic/invasive species (Figure 8). The shrub layer mostly constituted of Grewia flava. Grasses included Eragrostis rigidior; Digitaria eriantha; Eragrostis superba; Digitaria velutina and Heteropogon contortus. Forbs species and creepers include Blepharis subvolubilis; Cucumis myriocarpus; Ceratotheca triloba; Ipomoea sinensis subsp.blepharosepala and Leonotis ocymifolia.

The communities were found to be similar to other communities found on previous studies. It is just slightly more disturbed such as the communities of a road reserve due to the regular disturbance through vehicles and surveying.

Figure 7: Combretum Apiculatum Bushveld Community

Figure 8: Eragrostis/Digitaria Bushveld Grass Community

4.2.1.1 Red Data Plant Species

The Red Data species retrieved from SANBI PRECIS data for the grid square 2327DA can be seen in Table 8. These species along with species protected by the Limpopo Environmental Management Act (Act No 7 of 2003) and the National Forest Act (1998) were considered when assessing Red Data and protected species occurrence.

Table 8: Red Data Species Listed to Possibly Occur in the Project Grid Squares

Family	Species Name	Status
EUPHORBIACEAE	*Acalypha caperonioides var. caperonioides*	DDT
EUPHORBIACEAE	*Euphorbia waterbergensis*	Rare
MALVACEAE	*Corchorus psammophilus*	Threatened
POACEAE	*Eulalia aurea*	NT

No Red Data species were found to occur on the project area, however protected species were found. Protected species can be seen in Table 9 and include *Boscia albitrunca (Sheperds tree) and Sclerocarya birrea (Marula)*. These species were limited to a few representing specimens. The Marula found was still a very young sapling were the Sherperds tree was well established. Consultation with relevant authorities with regards to an application for a tree removal permit is recommended.

Table 9: Protected Species Found Within the Proposed Project Area

Species name	Protected status	Description	Image
Boscia albitrunca	National Forest Act protected	A small to medium sized tree to 7m with a rounded crown. The main stem is white or whitish-grey. The branches are stout and crooked. The leaves are clustered with a rounded apex, leathery and greyish-green.	

Species name	Protected status	Description	Image
Sclerocarya birrea	National Forest Act protected	A medium to large deciduous tree to 18m. The main stem is upright, branching high up with a spreading and rounded crown. The bark is pale grey-brown and the leaflets have long petiolules. The fruit is fleshy plum like – the Marula.	

4.2.1.2 Exotic and Invasive Plant Species

Due to the fact that the project area has been disturbed previously, exotics and invasives were throughout the project area but were limited to a few species. This can be due to the fact that the project site is only a small are therefore species differentiation and communities are limited. Species encountered include: *Cucumis myriocarpus; Solanum sp.; Leonotis ocymifolia; Ipomoea sinensis subsp.blepharosepala (minor weed) and Ceratotheca triloba (indigenous weed)*.

4.2.2 Animal Life

4.2.2.1 Mammals

4.2.2.1.1 Mammals Found During the Field Study

Burrows and holes of small mammals, which can possibly belong to mice, rats, suricates, etc. were found during the field survey. Sherman traps were set up to capture small mammals that are nocturnal, but no small mammals were captured. This can be due to the fact that during the wet season food supply is abundant and therefore small mammals are not as easily lured as in the dry season.

All the mammals recorded during the animal survey can be seen in Table 10. The only species of concern found on the site was *Raphicerus campestris* (Steenbok), a species protected by the Limpopo Province.

Table 10: Mammal Species Identified to Occur in the Project Area

Family	Scientific Name	Common Name
BOVIDAE	*Raphicerus campestris*	Steenbok
BOVIDAE	*Sylvicapra grimmia*	Grey /Common Duiker
CANIDAE	*Canis mesomelas*	Black-backed Jackal
CERCOPITHECIDAE	*Cercopithecus aethiops pygerythrus*	Vervet Monkey
CERCOPITHECIDAE	*Papio ursinus*	Chacma Baboon
FELIDAE	*Hystrix africeaustralis*	Porcupine
FELIDAE	*Lepus saxatilis*	Scrub/Savannah Hare
HERPESTIDAE	*Galerella sanguinea*	Slender Mongoose
PEDETIDAE	*Pedetes capensis*	Springhare
SCIURIDAE	*Paraxerus cepapi*	Tree Squirrel
SCIURIDAE	*Xerus inauris*	Cape Ground Squirrel
SUIDAE	*Phacochoerus africanus*	Warthog

4.2.2.1.2 Red Data and Protected Mammals

The Red Data species considered for this survey can be seen in Table 11. The probability of occurrence was estimated based on habitat requirement and distribution. No Red Data species were found due to the close proximity of urban development and other human activities. However Red data species were found within the region and therefore some species have a slight possibility of wandering through the project area or the area surrounding it.

Table 11: Red Data Species of the Limpopo Province

Category	Scientific Name	Common Name	Probability
Critically Endangered	*Diceros bicornis*	Black rhinoceros	Low
	Amblysomus julianae	Juliana's golden mole	Medium
Endangered	*Loxodonta africana*	African elephant	Low
	Lycaon pictus	African wild dog	Medium
Vulnerable	*Amblysomus gunningi*	Gunning's golden mole	Low
	Lutra maculicollis	Spotted-necked otter	Low
	Acinonyx jubatis	Cheetah	Medium
	Felis lybica	African wild cat	Medium
	Panthera leo	Lion	Low
Near Threatened	*Ceratotherium simum*	White rhinoceros	Low

4.2.2.2 Birds

4.2.2.2.1 Bird Species Found During the Field Survey

84 bird species were identified to occur within the regional area. Table 12 summarizes all species of birds recorded. This list cannot be considered as a complete list as many other birds can be present within any given season or day of the year. Of the birds recorded, no Red Data species were found, which is probably due to level of disturbance within the project area. It is recommended that any development should take place during the dry season so that the fledgling numbers are reduced.

Table 12: Bird Species Found During the Field Survey

Scientific Name	Common Name	Scientific Name	Common Name
Bostrychia hagedash	Hadeda Ibis	*Merops apiaster*	Eurasian Bee-eater
Bradornis mariquensis	Marico Flycatcher	*Merops hirundineus*	Swallowtailed Bee-eater
Bubulcus ibis	Cattle Egret	*Merops pusillus*	Little Bee-eater
Burhinus capensis	Spotted Dikkop	*Motacilla aguimp*	African Pied Wagtail
Calendulauda sabota	Sabota Lark	*Muscicapa striata*	Spotted Flycatcher

Scientific Name	Common Name	Scientific Name	Common Name
Cercotrichas paena	Kalahari Robin	*Myrmecocichla formicivora*	Anteating Chat
Chrysococcyx caprius	Diederik Cuckoo	*Numida meleagris*	Helmeted Guineafowl
Clamator glandarius	Great Spotted Cuckoo	*Oena capensis*	Namaqua Dove
Colius striatus	Speckled Mousebird	*Onychognathus morio*	Redwinged Starling
Columba guinea	Rock Pigeon	*Parus niger*	Southern Black Tit
Coracias caudata	Lilacbreasted Roller	*Passer diffusus*	Southern Greyheaded Sparrow
Coracias garrulus	Eurasian Roller	*Passer domesticus*	House Sparrow
Coracias naevia	Purple Roller	*Petronia superciliaris*	Yellowthroated Sparrow
Corvinella melanoleuca	Longtailed Shrike	*Plegadis falcinellus*	Glossy Ibis
Corythaixoides concolor	Grey Lourie	*Plocepasser mahali*	Whitebrowed Sparrowweaver
Creatophora cinerea	Wattled Starling	*Ploceus velatus*	Masked Weaver
Cuculus clamosus	Black Cuckoo	*Pternistis swainsonii*	Swainson's Francolin
Cuculus solitarius	Redchested Cuckoo	*Pycnonotus tricolor*	Blackeyed Bulbul
Dendroperdix sephaena	Crested Francolin	*Quelea quelea*	Redbilled Quelea
Dendropicos fuscescens	Cardinal Woodpecker	*Serinus flaviventris*	Yellow Canary
Dendropicos namaquus	Bearded Woodpecker	*Serinus gularis*	Streakyheaded canary
Dicrurus adsimilis	Forktailed Drongo	*Sigelus silens*	Fiscal Flycatcher
Egretta intermedia	Yellowbilled Egret	*Streptopelia capicola*	Cape Turtle Dove
Elanus caeruleus	Blackshouldered Kite	*Streptopelia semitorquata*	Redeyed Dove
Emberiza tahapisi	Cinnamonbreasted Rock Bunting	*Streptopelia senegalensis*	Laughing Dove

Scientific Name	Common Name	Scientific Name	Common Name
Erythropygia leucophrys	Whitebrowed robin	*Tockus leucomelas*	Southern Yellowbilled Hornbill
Estrilda astrild	Common Waxbill	*Trachyphonus vaillantii*	Crested Barbet
Euplectes orix	Red Bishop	*Tricholaema leucomelas*	Pied Barbet
Francolinus sephaena	Crested francolin	*Turdoides bicolor*	Pied Babbler
Francolinus swainsonii	Swainson's francolin	*Turdoides jardineii*	Arrowmarked Babbler
Fulica cristata	Redknobbed Coot	*Tockus leucomelas*	Southern yellowbilled hornbill
Granatina granatina	Violeteared Waxbill	*Turdus libonyanus*	Kurrichane Thrush
Hirundo cucullata	Greater Striped Swallow	*Turtur chalcospilos*	Greenspotted Dove
Hirundo rustica	Eurasian Swallow	*Upupa africana*	African Hoopoe
Indicator indicator	Greater Honeyguide	*Uraeginthus angolensis*	Blue Waxbill
Lamprotornis mevesii	Longtailed Starling	*Uraeginthus granatinus*	Violeteared Waxbill
Lamprotornis nitens	Glossy Starling	*Urocolius indicus*	Redfaced Mousebird
Laniarius atrococcineus	Crimsonbreasted Shrike	*Vanellus armatus*	Blacksmith Plover
Lanius collaris	Fiscal Shrike	*Vanellus coronatus*	Crowned Plover
Lanius collurio	Redbacked Shrike	*Vidua macroura*	Pintailed Whydah
Lybius torquatus	Blackcollared Barbet	*Vidua purpurascens*	Purple Widowfinch
Melaenornis pammelaina	Black Flycatcher	*Vidua reia*	Shaft tailed Whydah

4.2.2.2.2 Red Data and Protected Bird Species

No Red Data species were found on the project area, which is expected as the project area is small and disturbed. All Red Data species considered can be seen in Table 13. It does not host the necessary habitat for these Red Data species to inhabit it. However this does not eliminate the fact that they can possibly pass through/utilise the project area within time. Red Data species that have been recorded in the region previously have a high probability of occurring on site (per opportunity).

Table 13: Red Data Species Considered During the Field Survey

Status	Scientific name	Common name	Probability
Vulnerable	*Aquila rapax*	Tawny eagle	High
Vulnerable	*Ardeotis kori*	Kori bustard	High
Near threatened	*Buphagus erythrorhynchus*	Red billed oxpecker	High
Near threatened	*Ciconia nigra*	Black stork	Low
Near threatened	*Glareola nordmanni*	Black winged pranticole	Medium
Vulnerable	*Gyps africanus*	White backed vulture	High
Vulnerable	*Gyps coprotheres*	Cape vulture	High
Near threatened	*Leptopethilus crumeniferus*	Marabou stork	Low
Near threatened	*Mycteria ibis*	Yellow billed stork	Low
Vulnerable	*Polemaetus bellicosus*	Martial eagle	Medium
Near threatened	*Saggitarius serpentarius*	Secretary bird	High
Vulnerable	*Terathopius ecaudatus*	Bateleur	High
Vulnerable	*Torgos tracheliotos*	Lappet faced vulture	High

4.3 Cultural Characteristics

4.3.1 Sites of Archaeological and Cultural Interest

Review of relevant literature, archive and other databases and heritage assessments did indicate that Stone Age, Iron Age and Historical heritage resources exist in the wider landscape. However, no specific references were found to any resources near the proposed development.

A screening site visit was conducted on the 19th March 2012. While artefacts such as undiagnostic potsherds were noted (Plan 8), the site was found to be so degenerated that no context or site integrity remained. Furthermore, desktop survey of the 2327DA Lephalale 1: 50 000 map indicated that Zongezien has been cultivated extensively further affecting the integrity of any potential heritage resources. No historical structures or remains of any built environment resources were noted during the site visit.

Digby Wells was of the opinion that no further heritage assessments are required for this proposed development during the scoping phase. As such, an Initial Heritage Statement (IHS) requesting exemption for a Heritage Impact Assessment (HIA) was submitted to the South African Heritage Resources Agency (SAHRA). An exemption in this regard has been granted by SAHRA (Appendix F).

4.3.2 Environmentally Sensitive Landscapes

Environmentally Sensitive Landscape (ELS) are areas that have significant environmental features, such as wetlands, rivers and creeks and, groundwater recharge areas and the habitat of endangered and threatened species.

The surface water features in the project area are located along the tributary of the Mokolo River named Sandloop. The Sandloop tributary is a sensitive landscape in that it's currently impacted upon by the discharged untreated effluent from the existing MWWTP.

4.3.3 Visual Aspects

The proposed site is envisaged to theoretically have a visual impact (only during construction phase) due to the surrounding topography being very flat. However the lack of receptors in the area and the height of the savannah vegetation in the region should provide an adequate screen to reduce the visual impact considerably.

4.3.4 Traffic and Safety

In the vicinity of the project area there are two major intersections, namely the Grootegeluk and Lephalale/Stockpoort intersections.

The Grootegeluk intersection is located approximately 26 km east of the town of Lephalale, and approximately 15 km from the proposed project site. The Lephalale/Stockpoort intersection is located approximately 50 km east of the town of Lephalale and approximately 40 km south of the proposed project site.

4.3.5 Socio-economic Environment of the Municipal Area

The Lephalale Local Municipality is the biggest municipality in the Limpopo province (previously known as the Northern Province) covering an area of approximately 1,960,514 ha. The largest town in the municipal area is Lephalale (previously known as Ellisras) which consists of 42% of the municipal population and comprises the largest central economic node in the municipality (Lephalale Local Municipality, http://www.lephalale.com).

4.3.5.1 Demographics

According to Statistics SA Census (2001), the population of Lephalale Municipality was approximately 96,000 in 2001, representing just below 16% of the total population of the Waterberg District Municipality. The Lephalale Municipality's Integrated Development Plan (IDP) report estimated a population increase to approximately 121,144 by 2010. The population growth is expected to occur mainly in the urban areas of Lephalale town and surrounds. This is the second largest population in the Waterberg District. It is estimated that the average household size is four people, with approximately 26,256 households in the Municipality.

4.3.5.2 Employment and Unemployment

According to Statistics SA (2001), approximately 54% of the population were employed in 2001, leaving almost half of the population either not economically active or unemployed, as shown in Figure 9 below. The Lephalale IDP (2007/2008) estimated an increase in jobs available over the past few years with an estimated increase in rate of employment being 11.5% since 2000.

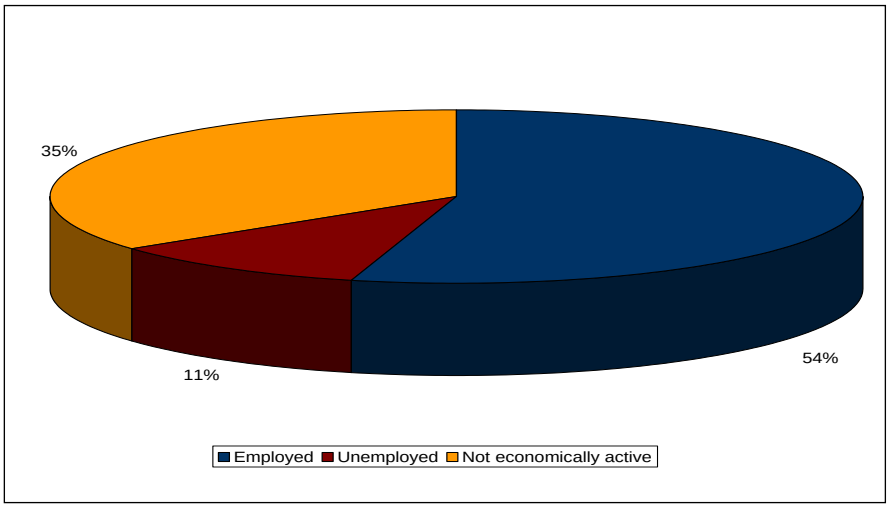

Figure 9: Employment Status for Lephalale Municipality's Population

Figure 10 below shows that Lephalale's employed population are working within a wide range of sectors. The dominant employment sector for the Lephalale Local Municipality, as shown in Figure 10 below, was agriculture in 2001. Agriculture employed a third of the employed population followed by private households, i.e. domestic work such as cleaners and gardeners. Community and social services employed the third largest percentage of the population.

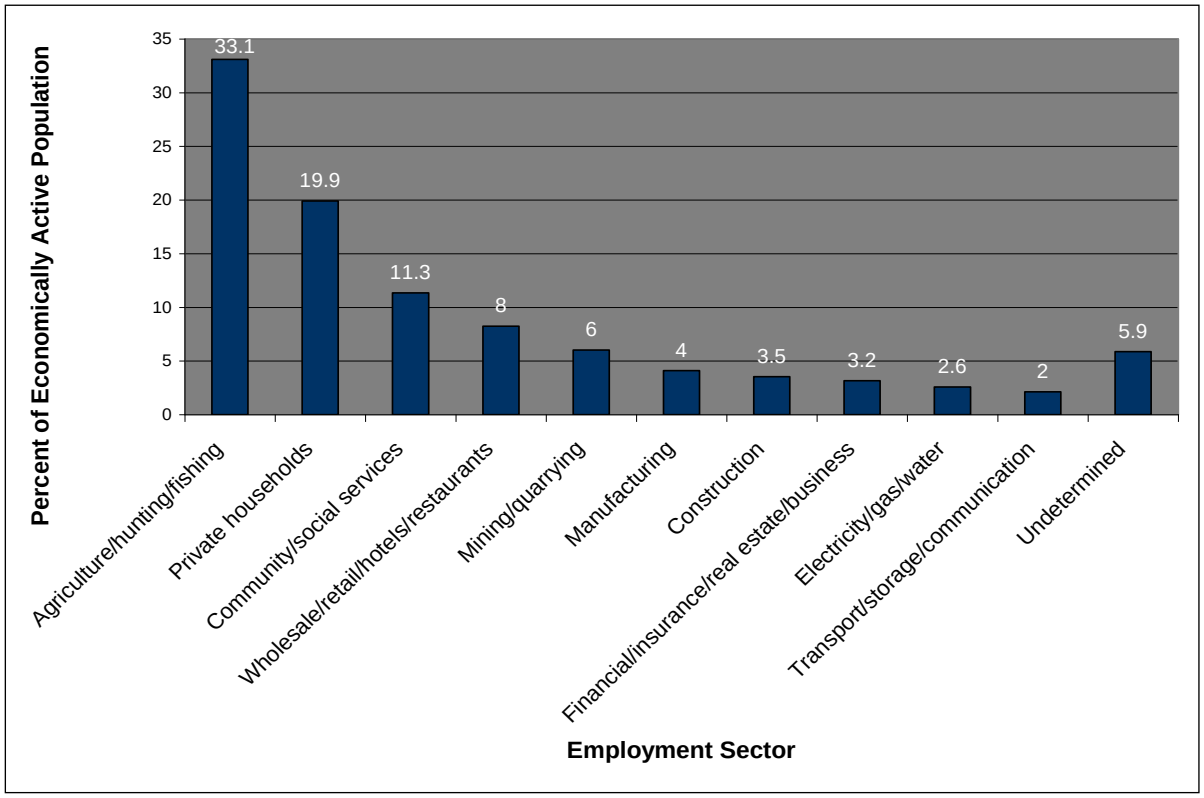

Figure 10: Lephalale Employment Sectors, 2001

4.3.5.3 Skills and Education

Figure 11 below shows the percentage of Lephalale Municipality's population in 2001 in relation to the highest level of education they have achieved. This shows that the local municipality's population was experiencing low levels of education and high levels of illiteracy. A quarter of the population had no schooling whilst only 6% had tertiary level education (Statistics SA, 2001).

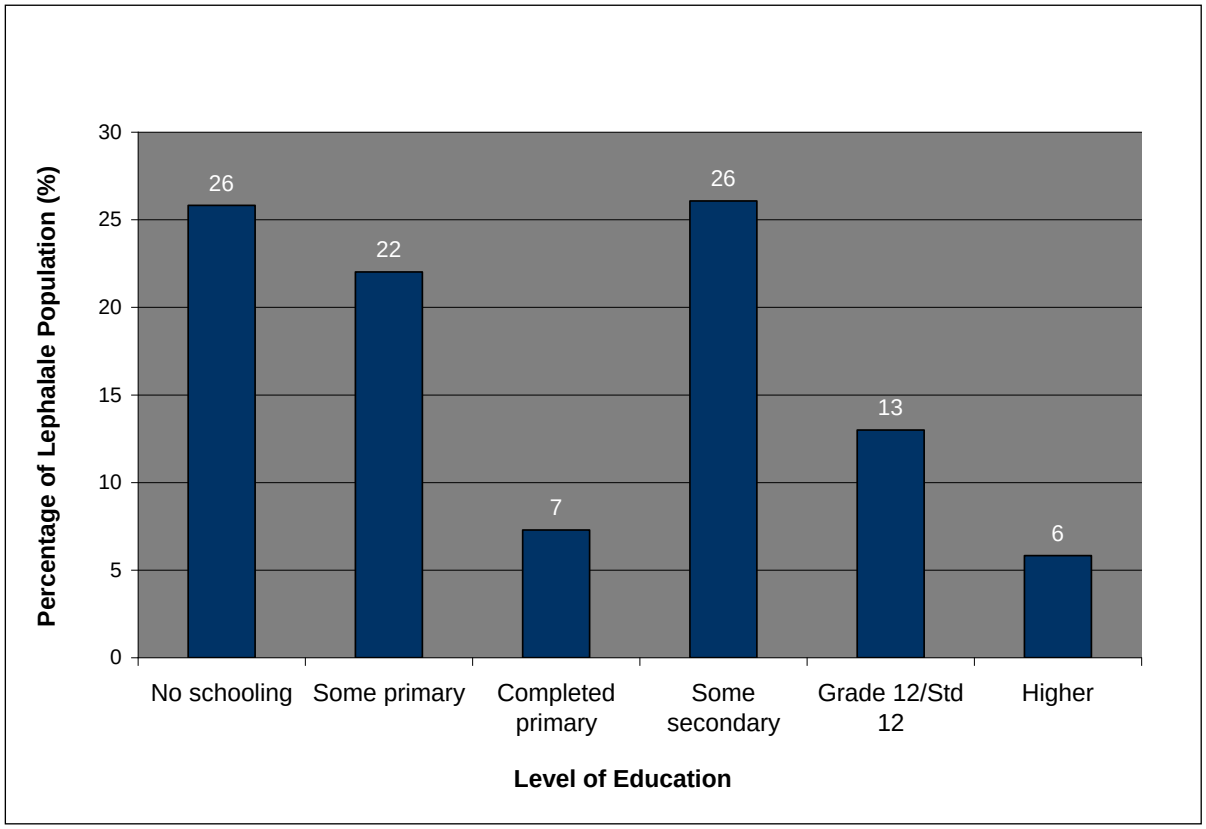

Figure 11: Education Levels of Lephalale Population, 2001

4.3.5.4 Infrastructure and Services

4.3.5.4.1 Energy Supply

Statistics SA (2001) reported approximately 65% of Lephalale Municipality's households using electricity for lighting. Candles were the second most used fuel for lighting at just over 31%. The main source of fuel for cooking and heating in the municipality, at 56 and 52 percent respectively, is wood. Electricity is the second most used source for cooking and heating with 35 % of the population using electricity for cooking and 40% of the population use electricity for heating (Statistics SA, 2001).

A number of settlements in Lephalale Municipality were electrified in 1997 and the municipality is still attempting to decrease the number of households without electricity. Rural areas, especially 'deep rural' areas such as Marapong, are the most affected by lack of electricity (Lephalale Local Municipality, 2006).

Some of the causes of the poor electricity provision in Lephalale Municipality include the following (Lephalale Local Municipality, 2006):

- High cost of establishing the Regional Electricity Distributors (REDs);
- Dispersed nature of rural settlements within the municipality increases the cost of service provision;

- Lack of funding; and
- Delays in the installation of appropriate infrastructure due to the municipality lacking the correct licence to provide and sell electricity.

4.3.5.4.2 Water Supply

Bulk water supply is from the Mokolo dam and pumped to Wolvenfontein storage dam, where it gravitates down to the Zeeland water purification works as well as the purification plant at Matimba power station. Bulk water gravitates down to the Grootgeluk mine and Eskom's Matimba power station. Lephalale town and Onverwacht are supplied with water from the Zeeland water purification works. Marapong is supplied with water from the Matimba power station (Lephalale SDF, 2012).

Effluent is treated at the Paarl wastewater treatment works.

In respect of water in the rural areas the following can be highlighted from the IDP: The rural areas obtain water from groundwater sources, of which 85% is from boreholes and 15% from well field boreholes in riverbeds. Four water schemes serve 38 villages through a network of 138 boreholes, where water is pumped from into reservoirs.

4.3.5.4.3 Sanitation

In respect of sanitation, the sewage discharge from Onverwacht/Ellisras area is treated at the Paarl-wastewater treatment plant. These works still have spare capacity of 3Ml/d.

Municipal sewage from Marapong is discharged to an oxidation pond system and currently exceeds it capacity which requires immediate upgrading.

Sanitation in the rural areas consist of informal pit latrine systems or Ventilated Improve

Pit Latrines (VIPL). It is estimate that 6% of households have no sanitation service.

The IDP finally submits in this regard that the pit latrine systems in the rural areas will have to be replaced with more appropriate environmentally acceptable sanitation systems.

4.3.5.4.4 Housing

The following summary below is based on the Lephalale's SDF, 2012.

The IDP indicates that there is a supply of 28 935 residential units for Marapong, Onverwavcht and Ellisras which represent an oversupply in Lephalale, especially into the upper market housing segment. It further indicates that there is a lower supply of housing in the rental and low-income market segment however. It becomes evident that a planned 5000 even in SDA 1 (the farm Altoostyd) will provide sufficient housing accommodation into the middle to lower income market segment.

What is important to note from the IDP is the proposal that due to the scattered nature of township development, the municipality is prompted to follow an infill approach into further human settlements (townships).

Housing development outside the urban core area/s.

The approach for development outside the core is on a basis of minimum intervention. Given the low growth potential the main approach into the IDP is therefore to sustain current levels of development. However, it is recommended in the IDP that:

- Alignment of government development initiatives is required to focus on the three nodal points areas of Thabo Mbeki; Setateng and Ga-Seleka;
- Housing provision should be aligned with demarcation of sites and infrastructure provision; and
- LED projects to be aligned with infrastructure to support sustainable projects, demarcation of sites and housing provision.

Projected housing demand for development nodal area 2.

The IDP indicates that it is expected that population in this node and settlements will gradually decrease due to the urbanisation process where people will relocate to Lephalale urban node in the search for new jobs.

However, the approach is that although it is expected that the population number might decrease, the need for housing should take cognisance of the dynamics of the situation which is influenced by:

- The number of existing units within river flood lines to be re-located;
- The impact of successful land claims which may result in re-settlement;
- Existing occupants on traditional land with Permissions to Occupy (PTO) to move to newly demarcated and serviced even in areas such as in the Thabo Mbeki extensions.

Other community facilities

It becomes clear from the IDP that provision of social services infrastructure should be reviewed with the intention to accommodate long term planning. It is also submitted in the IDP that traditional leaders allocate residential sites in the rural areas without consultation with the municipality, guidance and application of the land use management system.

4.3.5.4.5 Roads and Transportation

In January 2011, a Transport Master Plan (TMP) was completed for the Lephalale municipality (as part of the Spatial Development Framework (SDF)) by Aurecon Consulting Engineers together with a team of consultants.

It is submitted in the TMP that no commuter rail service currently exists within the LLM and Waterberg District. It further points out that: “The current status of public transport within the LLM was determined during the development of the Integrated Transport Plan 2010 (Lephalale ITP)… and hence deals with it as follows:

Two main modes of public transport, which are both privately owned, exist in Lephalale, namely:

- Taxi; and
- Bus.

Taxi operators prefer to operate along existing paved (tarred) roads, leading to a situation where local taxi services in the rural areas are predominantly focused on areas such as Thabo Mbeki, Setateng and Ga-Seleka situated along the D3100 route – the link between the R518 and R572. There are also long distance and cross-border taxi services.

In terms of bus services, there are four bus operators operating in Lepahale area with the focus on local services. One operator also covers cross-border services.

4.3.5.4.6 Education

According to the Lephalale IDP (2007/2008), there are 115 education facilities located in Lephalale Municipality (Table 14). The Lephalale Municipality website places this number at closer to 141, including 10 pre-primary schools. There are a number of public schools within Lephalale Municipality which are located on private land. Land claims may have a significant impact on these schools and future spatial development planning within the municipality (Lephalale Local Municipality, 2007/2008). Lephalale Municipality also has a Further Education and Training (FET) College, a state-aided college located in Lephalale town.

Table 14: Lephalale Municipality Educational Facilities

Type of Facility	Number of Facilities
Primary	77
Secondary	28
Special	1
Combined	8
Higher Learning Facility	1
Total	**115**
Source: Lephalale Local Municipality Integrated Development Plan, 2007/2008	

The number of learners in the municipality is estimated at almost 35,000 with an average of 27 learners per educator. The highest education attendance is in the school category at around 28%, with only limited attendance at tertiary education facilities. The following specific educational needs were identified for the Lephalale Local Municipality (Lephalale Local Municipality, 2007/2008):

- The maintenance of school and training facilities;
- Equipment at the majority of the rural schools;
- Additional classrooms; and
- Expand training courses to include technically and industry orientated training.

4.3.5.4.7 Health Care

Lephalale Municipality only has three hospitals located in Lephalale town, Marapong and Witpoort, outlined in Table 15. The Lephalale Municipality has six clinics and three mobile clinics. Similar to Limpopo province, the dispersed nature of the local municipality not only exacerbates the difficulty of service provision in the area, but increases the difficulty of accessing health facilities.

Table 15: Lephalale Municipality Hospital Facilities

Facility	Number of Beds	Number of Professional Staff		
		Doctors	Nurses	Specialists
Ellisras Hospital	82	13	33	3
Witpoort Hospital	42	6	15	4
Marapong Private Hospital	15*	13	8	7
Source: Lephalale Municipality Integrated Development Plan (2007/2008)				

Lephalale Municipality also has six clinics and three mobile clinics, as well as five pharmacies and is served by professional medical doctors, dentists, physiotherapists, educational psychologists, social workers and specialists from Pretoria and Polokwane.

5 PREDICTED ENVIRONMENTAL IMPACTS

5.1 Project Activities

The following activities in Table 16 below are associated with each of the key project phases within the project lifecycle.

Table 16: Project Activities

Phase	Activity	Description
Construction	1	Site Clearing: Removal of topsoil & vegetation
	2	Vehicular access and movement of construction activities
	3	Stockpiling, handling and storage of building material
Operation	4	Temporary storage of sewage sludge
	5	Storage and treatment of sewage effluent

5.2 Technical Methodology

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of environmental impact assessment practitioners, propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently

subjective. The weight assigned to the each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&APs and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific enquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved.

It is for this reason that it is crucial that all EIAs make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. The methodology employed for environmental impact assessment is divided into two distinct phases, namely, impact identification and impact assessment.

5.3 Impact Identification

Impact identification is performed by use of an Input-Output model which serves to guide the assessor in assessing all the potential instances of ecological and socio-economic change, pollution and resource consumption that may be associated with the activities required during the construction and operational phases of the project.

Outputs may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative in nature, and also include the product and waste produced by the activity. Negative impacts could include gases, effluents, dust, noise, vibration, other pollution and changes to the bio-physical environment such as damage to habitats or reduction in surface water quantity. Positive impacts may include the removal of invasive vegetation, construction of infrastructure, skills transfer or benefits to the socio-economic environment. During the determination of outputs, the effect of outputs on the various components of the environment (e.g. vegetation, water quality, etc.) is considered.

During consultation with I&APs perceived impacts were identified. These perceived impacts will become part of the impact assessment and significance rating in order to differentiate between probable impacts and perceived impacts.

5.4 Impact Rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the Input-Output model. As discussed above, it has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. This gives the project proponent a greater understanding of the impacts of his project and

the issues which need to be addressed by mitigation and also give the regulators information on which to base their decisions.

The equations and calculations were derived using Aucamp (2009).

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability

Where Consequence = Severity + Spatial Scale + Duration

And Probability = Likelihood of an impact occurring

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, duration and probability is rated out of seven. The weight assigned to the various parameters for positive and negative impacts in the formula.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in the EMP. The significance of an impact is then determined and categorised into one of four categories, as indicated in Table 17, which is extracted from Figure 12.

Significance

Probability / Likelihood		Consequence (severity + scale + duration)							
		3	5	7	9	11	15	18	21
		3	5	7	9	11	15	18	21
2	2	6	10	14	18	22	30	36	42
3	3	9	15	21	27	33	45	54	63
4	4	12	20	28	36	44	60	72	84
5	5	15	25	35	45	55	75	90	105
6	6	18	30	42	54	66	90	108	126
7	7	21	35	49	63	77	105	126	147

Figure 12: Probability Consequence Matrix

Table 17: Significant Threshold Limits

Significance		
High	108- 147	
Medium-High	73 - 107	
Medium-Low	36 - 72	
Low	0 - 35	

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural process will reduce the impact.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Very serious widespread social impacts. Irreparable damage to highly valued items	Province/ Region Will affect the entire province or region	Project Life The impact will cease after the operational life span of the project.	Likely The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	On-going serious social issues. Significant damage to structures / items of cultural significance	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires intervention of external specialists and can be done in less than a month.	On-going social issues. Damage to items of cultural significance.	Local Local extending only as far as the development site area	Medium term 1-5 years	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	Limited damage to minimal area of low significance, (e.g. ad hoc spills within plant area). Will have no impact on the environment.	Low-level repairable damage to commonplace structures.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

5.5 Identified Impacts

The following is a summary of the most significant impacts for the proposed MWWTP project.

5.5.1 Flora and Fauna

5.5.1.1 Construction Phase

The existing vegetation within the proposed project area has already been impacted upon as it was previously used for sludge and effluent disposal. It was also ploughed and thus allowing the secondary growth including the growth of more robust species such as exotics and invasives.

Stockpiling will smother plants and should be therefore limited to an area already disturbed. Furthermore it must be ensured that the topsoil is not mixed with other soils or waste, so that plant growth can persist after disturbance. The digging and excavation can harm small burrowing animals, therefore before digging commences a sweep must take place to determine small mammal colonies.

5.5.1.2 Operational Phase

Through the operation of the new plant, it will drastically improve the water quality downstream as treated sewage effluent will significantly reduce pollutant loading and therefore improve the ecological integrity of the surrounding area.

This will therefore have a positive impact on the ecological status. The purpose of the wastewater treatment project is to reduce the current amounts of untreated sewage that leaves the plant, thereby allowing for recovery of the inherent natural productivity of the ecosystem. Economic benefits will be derived from a healthy ecosystem. In terms of the habitat, this will not result in any further displacement of the animal through habitat modification.

In the event of poor management and maintenance, potential leakages or spillages could occur. This would have a potential negative impact on the surrounding ecological integrity.

5.5.2 Visual Impacts

5.5.2.1 Construction Phase

Construction phase-related visual impacts will arise as a consequence of construction activities taking place on site. Visual impacts in construction sites are generally attributed to poor house-keeping (e.g. presence of excavation sites, poorly managed construction waste, untidy storage of construction material, etc.).

5.5.2.2 Operational Phase

No visual impacts have been envisaged for the operational phase. However, through the operation of the new plant and the decommissioning of the old plant it will improve the visual amenity of the operation for the neighbouring residents.

5.5.3 Soils

5.5.3.1 Construction Phase

Vehicular movements during the construction phase will result in increased compaction on roads, leading to water runoff and erosion of soils. However, the impact is expected to be of minimal nature.

5.5.3.2 Operational Phase

The soil will be contaminated if there are leaks in the pipes or damage to the holding tanks. Through the operation of the new plant it will allow for the decommissioning of the old plant. This process will allow for the removal and/or rehabilitation of contaminated soil which will have a positive impact in the overall ecological integrity of the site.

5.5.4 Land Capability and Land Use

5.5.4.1 Construction Phase

Previous land use activities in the project area included sludge irrigation activities. At present there are no existing activities except for open grass land. This open area will therefore be lost as a result of the expansion of the plant.

5.5.4.2 Operational Phase

Current land capability of the area will be impacted upon as the open grassland area will be lost.

5.5.5 Surface Water

5.5.5.1 Construction Phase

Surface water flow or drainage will be impacted by the stockpiling of soil or the storage of building material. Water will be impacted by oil or fuel leaks from construction vehicles (however, minimal extra vehicles will be required on site).

5.5.5.2 Operational Phase

Due to the current status of the MWWTP, at present there are serious MRSA bacteria, cholera and other bacterial risks. Animals and birds drink the water posing mortality risks. The water quality is also unfit for human consumption as it's polluted with NH_4, NO_3, NO_2, E-coli, FOGs, etc.

There will be a positive impact as when the new plant becomes operational, it will take over the capacity from the existing plant which is no operating sufficiently and currently polluting the downstream river system. It will treat the effluent to a level which is suitable for discharge, however as the water will not be discharged and be transferred to the Boikarabelo Coal Mine, there will be a reduction in the level of water reporting downstream.. Therefore it will improve the downstream water quality conditions, although reducing the downstream flow.

In the event that the plant is not managed correctly during the operation, it may lead to a deterioration of the water quality.

5.5.6 Groundwater

No significant groundwater impacts are envisaged, except for the removal of the discharge from the river will have a positive impact on water quality and therefore reducing the potential negative impact on groundwater.

5.5.7 Air Quality

5.5.7.1 Construction Phase

The construction phase will increase dust levels due to increased activity of vehicles and stripping of vegetation. Therefore, construction activities will have negative impacts on air quality. However, the impact will be minimal.

5.5.7.2 Operational Phase

When the new plant becomes operational, it will allow for the decommissioning of the old plant. Through the operation of the new plant, it will reduce unpleasant odours from emitting from the operation and therefore improve the air quality for neighbouring residents.

5.5.8 Archaeology and Heritage

No impacts are predicted for heritage resources within the proposed project area, as the area does not have significant heritage resources. However, chance find procedures for the accidental discovery of human remains as encapsulated in NHRA Regulation Chapter XII must be followed in the event that human remains are exposed during construction.

5.5.9 Safety and Security

There will be a positive impact as the area will be fenced off to ensure safety and security.

5.5.10 Socio-economic Environment

Socially, various employment opportunities exist with the construction as well as the operational phase of the upgraded sewage treatment plant. Overall, the new plant will have a high positive impact on the social and environmental benefits of the community both directly and indirectly.

5.5.11 Odour Nuisance

Construction phase

No odour impacts are envisaged during the construction phase except for the existing smell from the existing plant.

5.5.11.1 Operational Phase

When the new plant becomes operational, it will allow for the decommissioning of the old plant. Through the operation of the new plant, it will reduce unpleasant odours from emitting from the existing operation and therefore reducing the occurrence of odour nuisance for neighbouring residents, therefore resulting in positive impacts.

5.5.12 Nuisance Impacts

5.5.12.1 Construction Phase

The proposed construction of the sewage treatment plant has the potential to generate the following potential nuisance impacts:

- Traffic;
- Dust emission; and
- Noise.

Local residents from Marapong will be inconvenienced by the movement of construction vehicles off site. Spillages on roads may also occur.

Dust emissions will be generated during excavations which are required to level out the site for the proposed sewage plant. These emissions will be exacerbated during the dry and windy winter months.

Noise impacts will occur as construction machinery will be involved in undertaking the required excavation and in upgrading the sewage plant. The presence of large number of houses in close proximity of the construction site highlights the need for strict control of noise emissions. These impacts will however be short-lived.

5.5.12.2 Operational Phase

No further impacts will be experienced during the operational phase.

5.6 Cumulative Impacts

Cumulative impacts are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of the ecosystems. Of particular concern is the knowledge that ecological/biophysical systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses. Cumulative impacts can be defined as "…changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable human activities…" The cumulative impacts have

been assessed qualitatively and can be further understood with the accumulation of information from the surrounding area as the project continues.

The cumulative impacts of the activities will be discussed according to the environment that is affected by the project activities. All impacts from the surrounding land will be taken into account.

5.6.1 Fauna and Flora

The removal of vegetation and destruction of habitats on site will contribute to the decrease in natural habitat available in the area. The impact is not expected to make a significant contribution to negative impacts on the fauna and flora in the area.

5.6.2 Soil

Soil in the region is currently impacted on by mining, power generation and agricultural activities.

The upgrade of the MWWTP will contribute to the loss of soil in the area on a small scale.

5.6.3 Air Quality

Existing mining, agricultural and construction activities (Eskom projects) contribute to the dust present in the air. The MWWTP will add to this in a small manner especially with the construction phase of the project.

Wind can transport dust several kilometres and deposit it in sensitive regions such as residential area and in rivers. In this instance, dust particles are tiny solid particles scattered or suspended in the air that could be considered a health risk in the local area.

5.6.4 Noise

The major sources of noise in the area are mining and power generation activities. The construction phase of the project will cause an increase in noise levels. Normal operation of the MWWTP afterwards is not expected to make a significant contribution to the noise in the area.

A summarised impacts assessment for all activities has been provided in Table 18 and Table 19 below.

Table 18: Impact Assessment for the Construction Phase

Activity, Phase and Impact					Impact Rating (before mitigation)								Impact Rating (after mitigation)						
Impacted Environment	Phase impact occurs (C, O, D, PC)	Activity No.	Activity	Summary of Impact	Reference in EIA	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Biophysical Impacts																			
Fauna and Flora	C	1	Site clearing: Removal of topsoil and vegetation	The existing vegetation within the proposed project area has already been impacted upon as it was previously used for sludge and effluent disposal. It was also ploughed and thus allowing the secondary growth including the growth of more robust species such as exotics and invasives.	5.5.1	N	3	3	3	9	6	54	N	2	2	3	7	5	35
	C	2	Vehicular access and movement of construction activities	Naturally occurring and domestic fauna species within this region include will be impacted, including natural cycles of species such as birds and the mortality of fauna species.	4.5.1	N	4	2	2	8	5	40	N	3	2	3	8	4	32
	C	3	Stockpiling, handling and storage of building material	Stockpiling will smother plants and should be therefore limited to an area already disturbed. The digging and excavation can harm small burrowing animals, therefore before digging commences a sweep must take place to determine small mammal colonies.	4.5.1	N	3	2	2	7	5	35	N	2	2	4	8	4	32
Visual	C	1	Site clearing: Removal of topsoil and vegetation	With the clearing of vegetation, the landscape will be more visible. Construction materials, activity and infrastructure will be increasingly visible.	5.5.2	N	2	2	2	6	7	42	N	1	2	1	4	4	16
	C	3	Stockpiling, handling and storage of building material	This activity will visually impact on receptor located in close proximity to the area. However this impact will be temporary in nature.	5.5.2	N	2	2	2	6	4	24	N	1	1	1	3	6	18
Soil	C	1	Site clearing: Removal of topsoil and vegetation	Loss of fertility and loss of soil can occur.	5.5.3	N	2	2	3	7	3	21	N	2	2	3	7	3	21
	C	2	Vehicular access and movement of construction activities	This traffic movement will result in increased compaction on roads, leading to water runoff and erosion of soils.	5.5.3	N	2	2	3	7	3	21	N	2	2	3	7	2	14

Activity, Phase and Impact					Impact Rating (before mitigation)								Impact Rating (after mitigation)						
Impacted Environment	Phase impact occurs (C, O, D, PC)	Activity No.	Activity	Summary of Impact	Reference in EIA	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
	C	3	Stockpiling, handling and storage of building material	Degradation of soil physical and chemical characteristics an occur during stockpiling.	5.5.3	N	2	2	2	6	2	12	N	2	1	1	4	2	8
Land capability and land use	C	1	Site clearing: Removal of topsoil and vegetation	The grassland area will be lost as a result of activities	5.5.4	N	1	4	2	7	7	49	N	1	3	1	5	5	25
Surface water	C	1	Site clearing: Removal of topsoil and vegetation	This activity will increase the erosion potential of the soil, thereby leading to siltation and consequent reduction of the volume of water in the catchment area.	5.5.5	N	2	2	3	7	4	28	N	2	2	3	7	4	28
	C	2	Vehicular access and movement of construction activities	This activity could potentially cause siltation of the surface water resource due to the dust deposition.	4.5.5	N	2	1	2	5	5	25	N	1	2	1	4	4	16
Air quality	C	1	Site clearing: Removal of topsoil and vegetation	The construction phase will increase dust levels due to: increase of vehicle and stripping of vegetation. Therefore, construction activities will have a negative impact on air quality.	4.5.7	N	2	2	3	7	7	49	N	2	2	1	5	6	30
	C	2	Vehicular access and movement of construction activities	The construction phase will increase dust levels due to: increase of vehicle and stripping of vegetation. Therefore, construction activities will have a negative impact on air quality.	5.5.7	N	2	2	2	6	6	36	N	2	2	1	5	6	30
	C	3	Stockpiling, handling and storage of building material	The construction phase will increase dust levels due to: increase of vehicle and stripping of vegetation. Therefore, construction activities will have a negative impact on air quality.	5.5.7	N	2	2	1	5	4	20	N	2	2	1	5	3	15
Odour Nuisance	C	1	Site Clearing: Removal of topsoil and vegetation	No odour impacts are envisaged during the construction phase, except from the existing plant.	5.5.11	N	1	1	1	3	1	3	N	1	1	1	3	1	3

Activity, Phase and Impact					Impact Rating (before mitigation)								Impact Rating (after mitigation)						
Impacted Environment	Phase impact occurs (C, O, D, PC)	Activity No.	Activity	Summary of Impact	Reference in EIA	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
	C	2	Vehicular access and movement of construction activities	No odour impacts are envisaged during the construction phase, except from the existing plant.	5.5.11	N	1	1	1	3	1	3	N	1	1	1	3	1	3
	C	3	Stockpiling, handling and storage of building material	No odour impacts are envisaged during the construction phase, except from the existing plant.	5.5.11	N	1	1	1	3	1	3	N	1	1	1	3	1	3
Social Impacts																			
	C	1	Site Clearing: Removal of topsoil and vegetation	Without proper fencing, pedestrians could potentially hurt themselves or damage the plant.	5.5.9	N	2	4	5	11	4	44	N	2	2	3	7	3	21
Safety and security	C	2	Vehicular access and movement of construction activities	Without proper fencing, pedestrians could potentially hurt themselves	5.5.9	N	1	2	3	6	3	18	N	1	1	1	3	2	6
Traffic	C	2	Vehicular access and movement of construction activities	Local residents from Marapong area might be inconvenienced by the movement of construction vehicles off site. Spillages on roads may also occur.	5.5.12	N	3	2	3	8	5	40	N	3	2	3	8	5	40
	C	1	Site Clearing: Removal of topsoil and vegetation	Noise impacts will occur during the required excavations and in upgrading the sewage plant.	5.5.12	N	3	2	3	8	5	40	N	3	2	3	8	5	40
Noise	C	2	Vehicular access and movement of construction activities	Noise impacts will occur during the required excavations and in upgrading the sewage plant.	5.5.12	N	3	2	3	8	5	40	N	3	2	3	8	5	40
Cultural and Heritage Impacts																			
Archaeology and Heritage	C	1	Site clearing: Removal of topsoil and vegetation	No impacts are predicted for heritage resources within the proposed project area, as the area does not have significant heritage resources.	5.5.8	N	1	1	1	3	1	3	N	1	1	1	3	1	3

Table 19: Impact Assessment for the Operational Phase

Activity, Phase and Impact					Impact Rating (before mitigation)								Impact Rating (after mitigation)						
Impacted Environment	Phase impact occurs (C, O, D, PC)	Activity No.	Activity	Summary of Impact	Reference in EIA	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Biophysical Impacts																			
Fauna and Flora	O	4	Temporary storage of sewage sludge prior to transportation off site	Pollution of the project area due to a lack in waste management will result in ecological degradation and a loss in the ecological integrity	5.5.1	N	3	6	3	12	4	48	N	2	4	2	8	3	24
	O	5	Storage and treatment of sewage effluent and accidental leakage or spillage of untreated sewage	Leakage of stored sewage or accidental spillages will affect the ecological integrity of the site. A stream is located close to the project site, if the sewage should affect the ground water or the close located stream; it would result in regional pollution and will affect all users of the water including fauna species and humans.	5.5.1	N	5	3	5	13	4	52	N	4	2	3	9	3	27
Visual	O		Operation of the Sewage treatment plant	Through the operation of the new plant and the decommissioning of the old plant, it will improve the visual amenity of the operation.	4.5.2	P	2	7	7	16	7	112	P	2	7	7	16	7	112
Soil	O	5	Storage and treatment of sewage effluent.	The soil may be contaminated if there are leaks in the pipes or damage to the holding tanks.	4.5.3	N	2	2	2	6	1	6	N	2	2	1	5	1	5
Land capability and land use	O	5	Storage and treatment of effluent	Current land capability will be impacted on, however, the surrounding land use is currently being developed.	4.5.4	N	3	5	2	10	7	70	N	3	5	2	10	7	70
Surface Water	O	4	Temporary storage of sewage sludge prior to transportation off site	This activity may impact on surface water resources.	4.5.5	N	2	1	1	4	1	4	N	1	1	1	3	1	3
	O	5	Storage and treatment of sewage effluent	There will be a positive impact as when the new plant becomes operational, it will take over the capacity from the existing plant which is not operating sufficiently and currently polluting the downstream river. It will treat the effluent to a suitable discharge.	5.5.5	P	4	7	5	16	7	112	P	4	7	5	16	7	112

Activity, Phase and Impact					Impact Rating (before mitigation)								Impact Rating (after mitigation)						
Impacted Environment	Phase impact occurs (C, O, D, PC)	Activity No.	Activity	Summary of Impact	Reference in EIA	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of Impact (positive / Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Groundwater	O		Removal of discharge from the river	The removal of discharge from the river will have a positive impact on the water quality and therefore reducing the potential impact on groundwater.	5.5.6	P	4	7	5	16	7	112	P	4	7	5	16	7	112
Air Quality	O	5	Storage and treatment of sewage effluent	Through the operation of the new plant, unpleasant odours will be emitted resulting in improved air quality.	5.5.7	P	4	7	3	14	7	98	P	4	7	3	14	7	98
Odour Nuisance	O	4	Temporary storage of sewage sludge prior to transportation off site	Unpleasant odour might emanate during the temporary storage of sludge, prior to disposal off site.	5.5.11	N	1	1	1	3	2	6	N	1	1	1	3	2	6
	O	5	Storage and treatment of sewage effluent.	Through the operation of the new plant, unpleasant odours will be emitted, resulting in improved air quality.	5.5.11	P	4	7	7	18	7	126	P	4	7	7	18	7	126
Social Impacts																			
Safety and security	O	5	Storage and treatment of sewage effluent	Through the operation of a new plant, proper fencing will be provided to ensure that pedestrians won't hurt themselves and ensure that there ill be no damage caused to the plant.	5.5.9	P	2	5	5	12	7	84	P	2	5	5	12	7	84

6 ENVIRONMENTAL MANAGEMENT PROGRAMME

The role of this EMP is to assist the LLM in achieving their environmental objectives and fulfilling their commitment to the environment.

The EMP describes methods and plans that can be used to reduce the negative environmental impacts and enhance the positive impacts. The EMP will be implemented throughout all phases of the project. In this regard, it is anticipated that monitoring will occur on a regular basis (variable depending on aspects to be monitored). The EMP serves a framework for implementing the mitigation measures during each phase of the project.

Only the environmental aspects that would be impacted on during the upgrade of the MWWTP have listed in Table 20 below.

Table 20: Environmental Management Programme

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
Construction Phase									
Site clearing: Removal of topsoil & vegetation	Fauna and Flora	Limit degradation and destruction of natural environment to designated project areas	Keep the footprint of the disturbed area to the minimum and designated areas only. Vegetate and wet stockpiles to limit erosion.	Daily	National Environmental Biodiversity Act 10 2004 (NEMBA)	Alien invasive programme is required, natural plants will self-feed	Construction and operational phases	Environmental Co-ordinator	Moderate-low
		Restrict alien invasive plant recruitment	Removal of vegetation during stripping and dump operation will be minimised to reduce the risk of open areas occurring.	Daily	Conservation of Agricultural resources Act (CARA), 1983 (Act no. 43 0f 1983)	Alien invasive control that includes inspection and appropriate control. Awareness raising for staff.	Construction and operational phases	Environmental Co-ordinator	Moderate-low
		Retain biological properties of soil	Stockpile soil in the correct layers, avoid excessive height, and slope	Weekly	Conservation of Agricultural resources Act (CARA), 1983 (Act no. 43 0f 1983)	Adhere to best practice guidelines	Construction and operational phases	Environmental Co-ordinator	Moderate-low
		Avoid destruction of protected species that were identified on site.	Consultation with relevant authorities is recommended to find out if a tree removal permit is required. An ecological audit will be required for fauna and flora.	Daily	National Environmental Biodiversity Act 10 2004 (NEMBA)	Removal of protected plant species, for re-planting in offset area.	Construction and operational phases	Environmental Co-ordinator	Moderate
	Visual	To reduce the negative visual impact that will occur from construction activities	- Only clear vegetation when and where necessary. - Only remove topsoil where necessary	During the entire timeframe of the activity.	N/A	Adhere to best practice.	Construction phase.	Environmental Co-ordinator	Low
	Soil	To prevent the loss of soil and its fertility.	Heavy machinery operators and truck drivers should be instructed to stay in designated construction site and roads.	Daily	N/A	- Implement traffic rules and train drivers to understand the rules -Implement vehicle maintenance schedule -Install oil collection pans in/under vehicles	Construction phase.	Environmental Co-ordinator	Low

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
	Land capability and land use	To prevent the loss of soil and its fertility.	Heavy machinery operators and truck drivers should be instructed to stay in designated construction site and roads.	Daily	N/A	- Implement traffic rules and train drivers to understand the rules -Implement vehicle maintenance schedule -Install oil collection pans in/under vehicles	Construction phase.	Environmental Co-ordinator	Low
	Air quality	To prevent an increase in dust levels	Dust suppression must be undertaken to reduce the dust particle from spreading.	Daily, except during rainy season.	In accordance with the draft national dust control regulations as well as ambient air quality standards in terms of the National Environmental Management Air Quality Act (Act 39 of 2004)	Adhere to best practise guidelines.	Construction phase.	Environmental Co-ordinator	Low
	Safety and security	To prevent pedestrians from potentially hurting themselves or damaging the plant	The entire construction area must be fenced off during construction and operational phase.	Construction and operational phases.	N/A	Adhere to best practice.	Construction and operational phase.	Environmental Co-ordinator	Low
	Noise	To prevent noise impacts that will occur during excavations and in upgrading the sewage plant.	- Use equipment with lower noise levels if economically viable. - Create a service and maintenance plan for vehicles and equipment as faulty vehicles and equipment generate more noise.	During the entire construction phase.	N/A	Regular vehicle and equipment inspection should be undertaken.	Construction phase.	Environmental Co-ordinator	Medium-low
Vehicular access and movement of construction activities	Soil	To prevent loss of soil structure due to compaction.	Heavy machinery operators and truck drivers should be instructed to stay in designated construction site and roads	Daily	N/A	- Implement traffic rules and train drivers to understand the rules. Must include no go areas. -Implement vehicle maintenance schedule -Install oil collection pans in/under vehicles	Construction phase.	Environmental Co-ordinator	Low

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
	Surface water	To prevent siltation on surface water resources from dust particles	Dust suppression must be undertaken to reduce the dust particle from spreading.	Daily, except during rainy season.	N/A	Adhere to best practice	Construction phase.	Environmental Co-ordinator	Medium- low
	Air quality	To prevent an increase in dust levels	Dust suppression must be undertaken to reduce the dust particle from spreading.	Daily, except during rainy season.	In accordance with the draft national dust control regulations as well as ambient air quality standards in terms of the National Environmental Management Air Quality Act (Act 39 of 2004)	Adhere to best practise guidelines.	Construction phase.	Environmental Co-ordinator	Low
	Safety and security	To prevent pedestrians from hurting themselves	The entire construction area must be fenced off during construction and operational phase.	Construction and operational phases.	N/A	Adhere to best practice.	Construction and operational phase.	Environmental Co-ordinator	Low
	Traffic	To prevent an inconvenience to the local residents through the movement of construction activities	Adhere to all safety measures that are in place on site, such as speed limits, safety signs and safe following distance.	During the entire construction phase.	N/A	Adhere to best practice.	Construction phase.	Environmental Co-ordinator	Medium-low
	Noise	To prevent noise impacts that will occur during excavations and in upgrading the sewage plant.	- Use equipment with lower noise levels if economically viable. - Create a service and maintenance plan for vehicles and equipment as faulty vehicles and equipment generate more noise.	During the entire construction phase.	N/A	Regular vehicle and equipment inspection should be undertaken.	Construction phase.	Environmental Co-ordinator	Medium-low
Stockpiling, handling and storage of building material	Fauna and Flora	Limit destruction of exposed areas and stockpiles to designated areas.	Keep the footprint of the disturbed area to the minimum and designated areas only.	Daily	National Environmental Biodiversity Act 10 2004 (NEMBA)	Alien invasive control that includes inspection and appropriate control. Awareness raising for staff.	Construction and Operational phases	Environmental Co-ordinator	Moderate-low

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
		Retain biological properties of soil	Stockpile soil in the correct layers, avoid excessive height, and slope	Weekly	Conservation of Agricultural resources Act (CARA), 1983 (Act no. 43 0f 1983)	Adhere to best practice guidelines	Construction and Operational phases	Environmental Co-ordinator	Moderate-low
		Prevent loss of burrowing fauna species	Ecological audit prior to excavation and stockpiling to determine how species can be avoided/if necessary relocated and to ensure no species get trapped/killed	Daily	National Environmental Biodiversity Act 10 2004 (NEMBA)	Ecological audits	Construction phase	Environmental Co-ordinator and auditor	Moderate
	Visual	To reduce the negative visual impact that will occur from construction activities	- Avoid unnecessary stockpiling and storage of building material.	During the entire timeframe of the activity.	N/A	Adhere to best practice.	Construction phase.	Environmental Co-ordinator	Low
	Soil	To prevent the degradation of soil physical and chemical characteristics.	Any accidental spillages should have sawdust applied immediately and then the affected soil should be dug out and removed and then disposed of with hydrocarbon waste by a reputable organisation.	Upon occurrence.	N/A	-Take manufacturer recommendations into account when designing and constructing hazardous material storage space. - Store sludge in the correct designated areas, specially designed and constructed for that purpose	Construction phase.	Environmental Co-ordinator	Low
	Air Quality	To prevent an increase in dust levels	Dust suppression must be undertaken to reduce the dust particle from spreading.	Daily, except during rainy season.	In accordance with the draft national dust control regulations as well as ambient air quality standards in terms of the National Environmental Management Air Quality Act (Act 39 of 2004)	Adhere to best practice.	Construction phase.	Environmental Co-ordinator	Low

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
Operational phase									
Operation of the MWWTP	Environment as a whole	To prevent unnecessary contamination on the environment	Ensure that the treatment plant is operating optimally at all times.	Continuous	N/A	-Maintenance checklist should be developed detailing every part of the system that needs to be checked on a weekly, monthly and annual basis; - Where possible, the volume and the quality of the treated effluent leaving the facility should be recorded to monitor the effectiveness of the system; and - Records of disposal must be obtained from the contractors responsible for cleaning and removing the solid waste.	Operational phase	Environmental Co-ordinator	Medium- Low
	Groundwater	To prevent groundwater contamination	Ensure that the treatment plant is operating optimally at all times.	Continuous	N/A	Any damages to the system must be repaired immediately.	Operational phase	Environmental Co-ordinator	Low
	Health and safety	To prevent any potential health and safety risks to humans	Ensure that proper fencing is installed and that training personnel responsible for the plant are well trained to operate it.	Continuous	N/A	- Contractor's responsible for cleaning the system need to undergo induction or suitable training for the job. - Ensure continuous check-ups around the fenced area.	Operational phase	Environmental Co-ordinator	Low
Temporary storage of sewage sludge	Odour	To minimise the smell of sludge during storage	The tanks and pipes must remain sealed to prevent odours	Continuous	N/A	Ensure that the design specifications are adhered to	Operational phase	Environmental Co-ordinator	Low

Activity	Aspect	Objectives	Mitigation/Management Measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person	Significance after Mitigation
Storage and treatment of effluent	Soil	To prevent soil contamination that might occur during the operational phase if there are leaks in the pipes or damage to the holding tanks	On-going maintenance check-ups around the treatment should be undertaken for any leaks. Should there be any leaks, the above mentioned management measure should be used.	Weekly	N/A	Ensure that the design specifications are adhered to.	Operational phase.	Environmental Co-ordinator	Low

7 ENVIRONMENTAL MONITORING

7.1 Monitoring Programme

7.1.1 Water Monitoring Programme

A water monitoring programme is recommended to enable a complete assessment of any potential negative environmental impacts that could occur from the activities associated with the MWWTP.

The approach to water management should be as follows:

- Step 1: Determine the baseline quality conditions during the pre-construction timeframe;
- Step 2: Implement a water monitoring programme to continuously monitor quality information, to detect any variance from predicted conditions, for the timeous implementation of corrective action, compensation and enhanced management of contaminant control; and
- Step 3: Use the monitoring results to continually update future planning.

Constituents to be analysed for have been summarised in Table 21 below.

Table 21: Wastewater limit values applicable to discharge of wastewater

**Source: Small Wastewater Treatment Works DPW Design Guidelines, June 2012*

Variables and substances	Existing SA General Standards	Existing SA Special Standards
Chemical oxygen demand	75 mg/l	30 mg/l
Colour, odour or taste	No substance capable of producing the variables listed	
Ionized and unionized ammonia (free saline ammonia) (as N)	3.0 mg/l	2.0 mg/l
Nitrate (as N)	15 mg/l	1.5 mg/l
pH	Between 5.5 and 9.5	Between 5.5 and 7.5
Phenol index	0.1 mg/l	
Residual chlorine (as Cl)	0.25 mg/l	0
Suspended solids	25 mg/l	10 mg/l
Phosphorous (Ortho phosphate) (as P)	10 mg/l	1 mg/l
Total aluminium (as Al)	-	
Total cyanide (as Cn)	0.02 mg/l	0.01 mg/l
Total arsenic (as As)	0.02 mg/l	0.01 mg/l
Total boron (as B)	1.0 mg/l	0.5 mg/l
Total cadmium (as Cd)	0.005 mg/l	0.001 mg/l
Total chromium III (as Cr III)	-	-
Total chromium VI (as CrVI)	0.05 mg/l	0.02 mg/l
Total copper (as Cu)	0.01 mg/l	0.002 mg/l
Total iron (as Fe)	0.3 mg/l	0.3 mg/l
Total lead (as Pb)	0.01 mg/l	0.006 mg/l
Total mercury (as Hg)	0.005 mg/l	0.001 mg/l
Total selenium (as Se)	0.02 mg/l	0.02 mg/l
Total zinc (as Zn)	0.1 mg/l	0.04 mg/l
Faecal coliforms per 100 ml	1000	0

8 CONCLUSION

The MWWTP will be upgraded to effectively treat 16 Ml/day of effluent and transported via an authorised 58 km pipeline (still to be constructed) to the proposed Boikarabelo Coal Mine for use in the mining operations.

No highly significant negative impacts were identified. The negative impacts identified either had a medium-low or low significance rating. The most significant negative impact will be loss of land. It is expected that this project does not pose a major risk to the environment.

The overall positive impacts (social and environmental) will outweigh the negative impacts identified by far.

Digby Wells Environmental is of the opinion that the project should definitely go ahead.

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Appendix A: Plans

Plan 1: Regional Setting

Plan 2: Land Tenure

Plan 3: Regional Geology

Plan 4: Topography

Plan 5: Soils

Plan 6: Land Use

Plan 7: Quaternary Catchments

Plan 8: Heritage Resources

Appendix B: Curriculum Vitae

Appendix C: Engineering Designs

Appendix D: PPP Report

Appendix E: Fauna and Flora

Appendix F: Initial Heritage Statement and Letter of Exemption by SAHRA