

Draft Environmental
Impact Assessment
Report

Diepsloot East Residential Development, City of Joburg

Newtown Landscape Architects cc
Yonanda Martin & Christa Otto
August 2013



**PROPOSED DIEPSLOOT EAST RESIDENTIAL DEVELOPMENT
DIEPSLOOT
JOHANNESBURG METROPOLITAN MUNICIPALITY**



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Report from Electrical Engineer - DJJC

Letters from Pikitup and DWA – Waste Management

Appendix D: Public Participation Process

Proof of PPP - 2010

- Proof of Newspaper Adverts
- Proof of Site Adverts
- Notice to Registered I&APs
- Minutes of Public Meetings
- Attendance Register
- Presentations
- Comments received from I&APs
- Comments & Responses Report

List of Registered I&APs

Proof of PPP - 2013

- Proof of Newspaper Adverts
- Proof of Site Adverts
- Notice to Registered I&APs

Appendix E: Specialist Studies

- Fauna & Flora Report
- Wetland Assessment Reports
- Heritage Impact Assessment
- Giant Bullfrog Assessment

Appendix F: Management Plans

- Environmental Management Plan
- Waste Management Plan

Appendix G: Landscape Development Plan

Appendix H: Environmental Impact Assessment

Appendix I: CV

ACRONYMS AND ABBREVIATIONS

Arup	Traffic Engineers
Bigen Africa	Consulting Engineers
BRT	Bus Rapid Transit
City of Joburg	City of Johannesburg
CLO	Community Liaison Officer
DJJC	Electrical Engineers
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EmbaPM	Previous Project Management Team
EMP	Environmental Management Plan
EXT	Extension
GDARD	Gauteng Department of Agriculture and Rural Development
GDE	Gauteng Department of Education
GDHS	Gauteng Department of Human Settlement
GDLGH	Gauteng Department of Local Government and Housing
GECKO	Greater Kyalami Conservancy
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Virus
HOA	Home Owners Association
I&APs	Interested and Affected Parties
JRA	Johannesburg Road Agency
kV	Kilovolt
kVA	Kilovolt – Ampere
LDP	Landscape Development Plan
MVA	Megavolt – Ampere
Metroplan	Appointed Town Planners
Nanza	Current Project Management Team
NEMA	National Environmental Management Act
NEM:WA	National Environmental Management Waste Act
NHRA	National Heritage Resource Act
NLA	Newtown Landscape Architects cc
NMT	Non-motorised Transport
NWA	National Water Act

PPE	Personal Protective Equipment
PWV	Pretoria – Witwatersrand – Vereeniging
RDP	Reconstruction and Development Programme
SafDev Tanganani (Pty) Ltd	Previous Land Owner
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Road Agency Limited
SDF	Spatial Development Framework
STD	Sexual Transmitted Diseases
SWMP	Storm Water Management Plan
TIA	Traffic Impact Assessment
TRF	Transformer
UDF	Urban Development Framework
UNISA	University of South Africa
WMP	Waste Management Plan
WULA	Water Use License Application
WWTW	Waste Water Treatment Works

1. INTRODUCTION

1.1 Introduction

Newtown Landscape Architects cc were appointed by SafDev Tanganani (Pty) Ltd to conduct an Environmental Impact Assessment (EIA) for the proposed establishment of Diepsloot East Residential Development on Portions RE/2 and 123 of the farm Diepsloot 388 JR, City of Johannesburg Metropolitan Municipality (City of Joburg). During the Environmental Impact Assessment (EIA) phase there were however changes as the project became a more critical and urgent project. The Gauteng Department of Local Government and Housing (GDLGH), now known as the Gauteng Department of Human Settlement (GDHS) approached SafDev Tanganani (Pty) Ltd and an agreement was reached that the GDHS will buy the property from SafDev Tanganani (Pty) Ltd and will take over the project. Emba PM was appointed as the Project Management Team and Metroplan were appointed as the Town Planners. In 2012 a new Project Management Team, NANZA Consulting, was appointed. Due to the appointed of a new Project Management Teams and town planner as well as environmental concerns there were changes to the layout of the development. This will be discussed in detail under Section 4.

The proposed project was registered with the Gauteng Department of Agriculture and Rural Development (GDARD) under the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulations 2006. Since 2006 the Environmental Impact Assessment Regulations changed and therefore a new application was submitted according to the Environmental Impact Assessment Regulations 2010. The proposed activities to be undertaken are listed activities in terms of Government Notice R661 and R662 of 30 July 2010 and it requires that environmental authorisation be applied for. The following Activities were applied for:

Government Notice No. R661:	
Activity 9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water <ul style="list-style-type: none"> i. With an internal diameter of 0.36 metres or more; or ii. With a peak throughput of 120 litres per second or more, Excluding where: <ul style="list-style-type: none"> a) Such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b) Where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
Activity 11	The construction of: <ul style="list-style-type: none"> i. Canals ii. Channels

	<ul style="list-style-type: none"> iii. Bridges iv. Dams v. Weirs vi. Bulk storm water outlet structures vii. Marinas viii. Jetties exceeding 50 square metres in size ix. Slipways exceeding 50 square metres in size x. Buildings exceeding 50 square metres in size xi. Infrastructures or structures covering 50 square metres or more <p>Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</p>
Activity 18	<p>The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from</p> <ul style="list-style-type: none"> i. A watercourse ii. The sea iii. The seashore iv. The littoral active zone, an estuary or a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever distance is greater <p>But excluding where such infilling, depositing, dredging, excavation, removal or moving</p> <ul style="list-style-type: none"> a) Is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or b) Occurs behind the development setback line.
	c)
Government Notice No. R662:	
Activity 15	<p>Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;</p> <p>Except where such physical alteration takes place for</p> <ul style="list-style-type: none"> i. Linear development activities; or ii. Agricultural or afforestation where activity 16 in this Schedule will apply.

The methodology used for the assessment was to investigate all environmental issues associated with the project. Environmental assessment procedures followed so far, according to the National Environmental Management Act, 1998 (Act 107 of 1998) as amended and the Environmental Impact Assessment Regulations, 2010 are:

- Submission of an application form on 6 July 2007.

- Statutory advertising on site, 12 July 2007.
- Advertising in a local newspaper. The advertisement was placed in The Star on 12 July 2007.
- Public Participation, the purpose of which is to inform all relevant I&APs by means of a Public Meeting. The meeting was held on 13 September 2007.
- Circulation of the Draft Scoping Report to all registered I&APs.
- Submission of the Scoping Report to GDARD on 30 January 2008.
- GDARD authorization was received on 9 January 2009 to proceed with the EIA Phase.
- The Public Participation Process for the EIA phase included the notification to I&APs of comments received from GDARD on the Scoping Report.
- GDARD's comments on the Scoping Report were sent to registered I&APs on 2 February 2009.
- A meeting with the Councillors, Home Owner Associations (HOA) and Conservancies was held on 24 November 2009 to discuss the changes in the layout as well as the change in ownership of the development.
- A Public Meeting was held on 30 November 2010 and a follow up meeting was held on 22 February 2011. Another follow up meeting was held on 15 March 2013.
- Re-submission of the Application according to the Environmental Impact Assessment Regulations 2010 on 26 July 2013.
- Re-advertising the project:
 - On site – 6 September 2013
 - Local Newspapers
 - Fourways Review – 5 September 2013
 - Midrand Reporter – 4 September 2013
 - Notifications to Stakeholders and I&APs – 4 September 2013
- The Draft EIA Report was sent to all registered I&APs, stakeholders and State Departments.
- A Public Meeting will be held to discuss the EIA Report either the last week of September 2013 or the first week of October 2013. The date will however be confirmed.
- The Final EIA Report will be circulated to all registered I&APs before submission to GDARD.

1.2 Terms of reference

The environmental impact assessment phase was undertaken in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) as amended and the Environmental Impact Assessment Regulations, 2010.

1.3 Purpose of the Environmental Impact Assessment Report

The purpose of the Environmental Impact Assessment Report is to ensure that the environmental implications of decisions are taken into account before decisions are made. Social and

environmental implications are also considered. The Environmental Impact Assessment Report presents the findings of the assessment, namely the potential impacts, both positive and negative, of the proposed development. The extent, duration, intensity, probability, significance and people that will be affected are all taken into account. Possible mitigation measures are identified and discussed in the report. Findings presented in the Environmental Impact Assessment provide the basis for an Environmental Management Plan.

1.4 Environmental Consultant

Newtown Landscape Architects cc is a Landscape Architecture firm, specialising in Urban Design, Environmental Planning, Landscape Architecture and Environmental Impact Assessments. Newtown Landscape Architects has been in practice for 23 years and has consulted on many large scale projects such as Ennerdale Extension 16 Residential Development (Gauteng Department of Housing and Local Government), Crane Valley Estate (Crane Valley Lifestyle Estate) and Glen Marais Extension 102 and 103 (Char Trade 246).

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1.5 The Project Team.

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TOWN PLANNER

Metroplan

Contact person

Deon Bester

ENGINEERS

Bigen Africa

Contact person

Llewellyn Jacobs

2. LEGAL REQUIREMENTS OF THE PROPOSED DEVELOPMENT

Environmental Impact Assessment process, which includes a Scoping study, is required by legislation. The process ensures that all relevant information is presented in order to facilitate good management decision-making. The legislations that require development projects to undergo through the Scoping / EIA Process are:

- 2.1. National Environmental Management Act (act 107 of 1998) as amended: This Act requires that the report concerning the impact of the proposed development on the environment be prepared. There are certain activities that are listed as activities that require EIA process. These activities are listed in Government Notice R386 and R387, 21 April 2006. The proposed development, which is the rezoning of "Undetermined" land into residential, is listed under Activity 2 (R387). Please note that although there are new Regulations (NEMA 2010) the proposed project falls under the NEMA 2006 Regulations as the application was submitted during the period of the NEMA 2006 Regulations. Therefore the processes followed are as per the NEMA 2006 Regulations and not the NEMA 2010 Regulations.
- 2.2. Constitution of the Republic of South Africa (Act 108 of 1996): Section 24(b)(i) encourages prevention of pollution and ecological degradation. Section 24(b) (iii) promotes ecologically sustainable development.
- 2.3. National Heritage Resource Act of 1999 (Act 25 of 1999) (NHRA): Section 34, no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the relevant provincial heritage resources authority (SAHRA).
- 2.4. The National Water Act (Act No 36 of 1998).
- 2.5. National Environmental Management: Waste Act 2008 (Act 59 of 2008)
- 2.6. The National Environmental Management Biodiversity Act, 2004 (Act No.10 of 2004).

The following policies and guidelines were consulted:

- From the NEMA Environmental Impact Assessment Regulations Guideline and Information Document Series the following guidelines were used:
 - Guideline on Public Participation in the Environmental Impact Assessment Process (October 2012)
 - Draft Guideline on Need and Desirability in Terms of the Environmental Impact Assessment (EIA) Regulations, 2010 (October 2012)
 - Guideline on Alternatives (August 2010)
- GDARD requirements for Biodiversity Assessments (2008 & 2012)
- City of Johannesburg Spatial Development Framework.

3. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Environmental Impact Assessment (EIA) process that was undertaken for Diepsloot East Residential Development consists of three main phases. The phases of this process are the Application and Authorization Phase, Scoping Phase and EIA phase.

3.1 Application and Authorisation

Newtown Landscape Architects submitted a Scoping / EIA application to GDARD of Agriculture and Rural Development on 6 July 2007 after which authorisation was received from GDARD to proceed with the Scoping process (24 July 2007), GAUT ref: 002/07-08/N0420. A new application was submitted to GDARD on 26 July 2010 and authorisation to proceed was 2 August 2013, GAUT ref: 002/13-14/E0124

3.2 Scoping Phase

The Scoping study is a requirement by EIA legislation in applying for authorization with the Department of Agriculture and Rural Development. The study involves public consultation, gathering of information to identify potential impacts to the environment and possible alternatives to the development and compiling of a plan for EIA. The Scoping Report was submitted to GDARD and approved on 9 January 2009.

3.3 EIA Phase

The EIA Phase will include the integration of the findings by specialists and the outcome of the Scoping process in order to enable documentation of one report. During this phase the I&APs will be addressed and all issues and mitigation measures will be discussed. A detailed Environmental Impact Assessment will be done to determine the extent of the impacts the development might have on the environment and the surrounding community. A detailed Environmental Management Plan will also be included in this phase.

4. DESCRIPTION OF PROJECT

4.1 Locality

The project is located in Diepsloot, City of Johannesburg Metropolitan Municipal area. The site is situated along the R511 (William Nicol Drive Extension) and between the N14 and Knoppieslaagte Road. The site is located right across the existing Diepsloot West Township and is approximately 10 km north of Bryanston and 8 km east of Lanseria Airport. Please refer to Figure 1: Locality Map and Figure 2: Aerial Photograph, also attached as Appendix A.

4.2 Property Description

The development is going to cover portions RE/2 and 123 of the farm Diepsloot 388 J.R. The property is currently vacant and in a degraded state.

Vegetation within the proposed site for development is predominantly grassland, described in the latest Vegetation Map of South Africa, Lesotho and Swaziland as Egoli Granite Grasslands (Mucina & Rutherford 2006). The vegetation is however disturbed due to various human activities.



Photograph 1: Human activities lead to a degraded site

A stream associated with a wetland area runs through the proposed site from east to west. The wetland is however very degraded due to the negative impact of human activities. A smaller stream that runs along the western boundary of the site connects with the wetland system. There is also a small artificial dam and wetland on the southern section of the site.



Photograph 2: Wetland on northern section of the proposed site



Photograph 3: Artificial Dam on the southern section of the proposed site.

4.3 Current Land Use

The land is zoned “Agricultural Land” but is currently not used for agricultural purposes. Although the property is vacant it is being used by residents from the Diepsloot West Township for the following activities:

- Soccer field
- Place of Worship
- Harvesting of grass for thatching
- Washing of clothing
- Sanitation

During previous site visits it was noted that an informal house was erected on site but it seems like the house has been removed.



Photograph 4: Informal house found on site

There is also a graveyard found on site which is no longer in use. There are approximately 100 graves in the graveyard and it varies from formal graves to more informal graves.



Photograph 5: Graveyard found on site (photograph taken by Francois Coetzee)

4.4 Surrounding Land Use

The surrounding land use is a mixture of residential, business and open space. To the west of the site, along the R511 (William Nicol), is the existing Diepsloot West Township, the Diepsloot Mall is just southwest of the site. To the south of the site are business properties which are mainly used for construction businesses as well as car dealers. There is also a trout farm and a reptile business just south of the site. To the east of the site are mainly vacant properties, the Nelson Lodge and small holdings that are mainly used for equestrian purposes. To the north are mainly residential properties.

There are also three properties which are proposed new developments. These properties include:

- Tanganani Ext 7 (Portion 119 of the farm Diepsloot 388 JR) located directly north of the site;
- Tanganani Ext 9 (Portion 100 of the farm Diepsloot 388 JR) located to the southeast of the site;
- Tanganani Ext 8 (Portion 19 of the farm Diepsloot 388 JR) located on the eastern boundary of the proposed site. The property was previously used as the Pooks Hill Hotel and Conference facility.

Refer to Figure 3: Land Use Map, also attached as Appendix A.

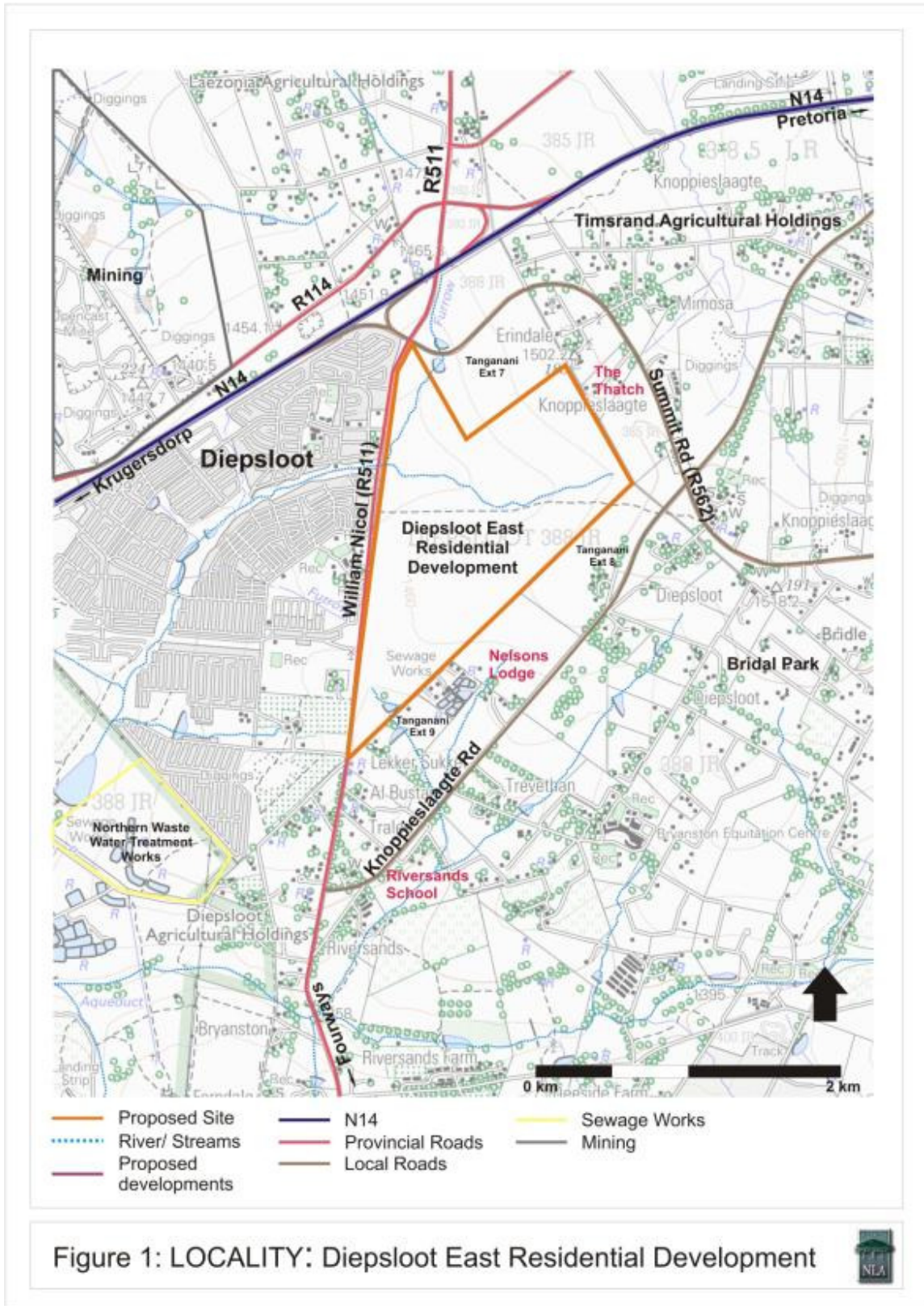


Figure 1: Site Locality.

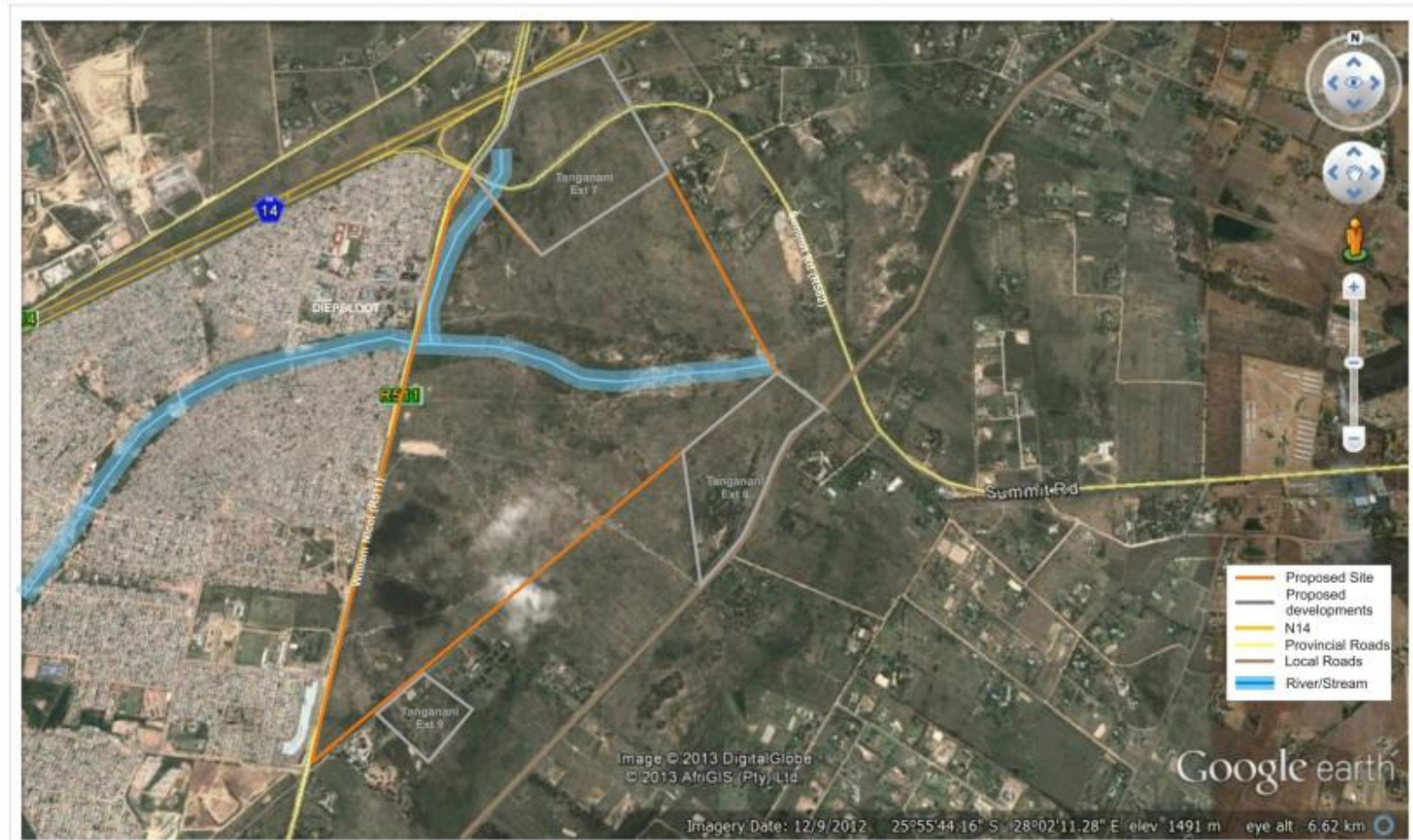


Figure 2: AERIAL PHOTOGRAPH: Diepsloot East Residential Development



Figure 2: Site Locality: Aerial Photograph.

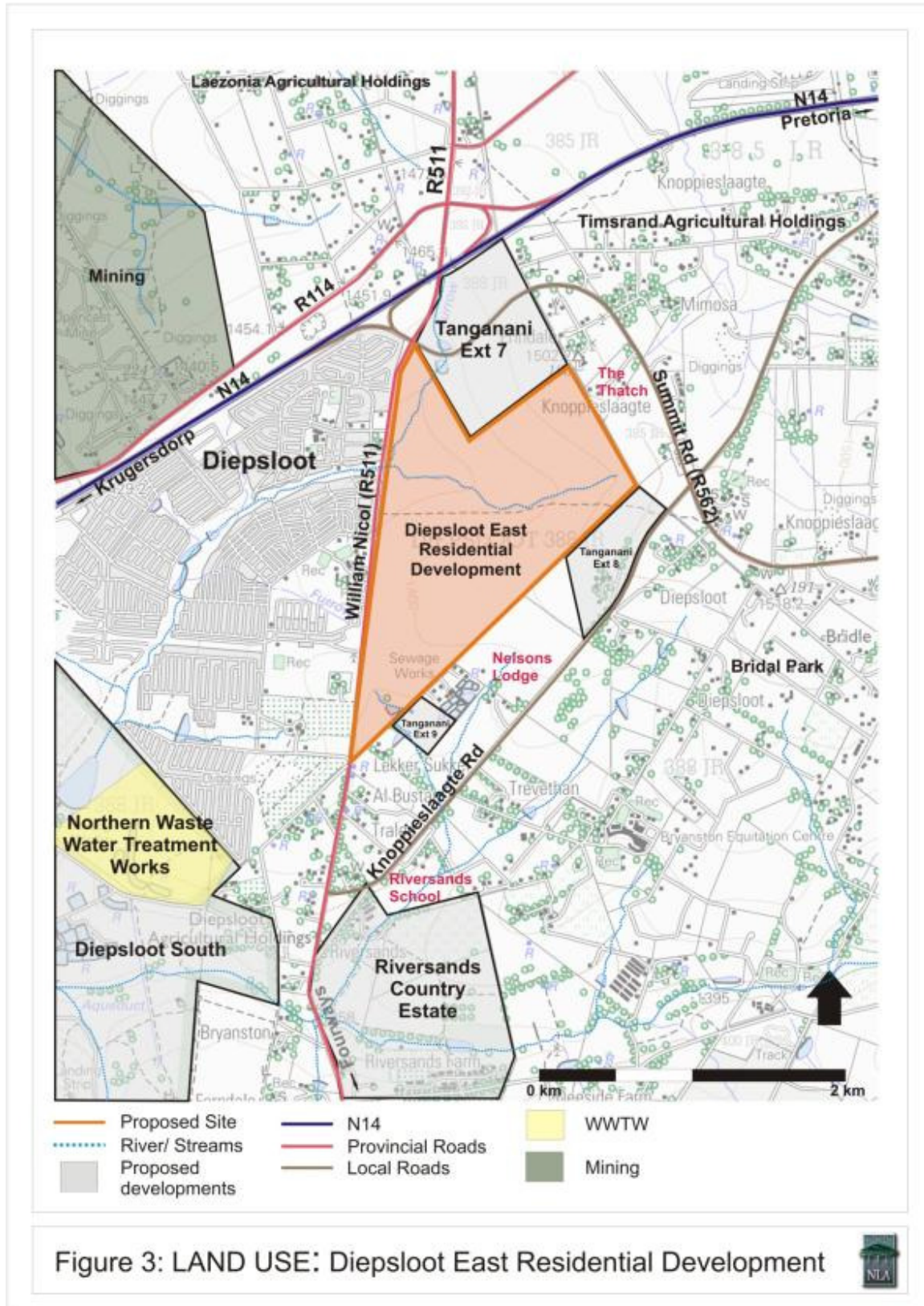


Figure 3: Land Use Map.

4.5 Proposed Project

The proposed site is zoned "Agricultural Land" in terms of the Peri-Urban Town Planning Scheme, 1975. The proposed development aims for the rezoning of this land into a mixed used development. The town planning will provide for:

- i. Residential
 - Residential 1 (Single Residential and Rental Units)
 - Residential 2 (50 units / ha)
 - Residential 2 (120 units / ha)
- ii. Business 1
 - Shopping Centre
- iii. Educational
 - Primary Schools
 - Secondary Schools
- iv. Municipal
 - Sport Field
 - Conservation Area
 - Recycling Area
 - Taxi Holding Area
- v. Institutional
 - Community Facility
 - Hospital (Clinic)
- vi. Cemetery
- vii. Public Open Space

The proposed site is approximately 237, 4346 hectares.

The intended development will provide approximately 7 939 mixed housing opportunities.

Refer to Appendix B for the Proposed Layout Plan and the Urban Design Framework (UDF) by Metroplan and The Urban Design Studio.

4.5.1 Residential

The residential units will consist of the following housing types:

- **TYPE 1:** 29ha of fully subsidised housing units at a density of 40u/ha.
- **TYPE 2:** 16ha of 3 storey walk-up flats at a density of 120u/ha.
- **TYPE 3:** 14.42ha (excluding roads) of bonded housing on the eastern side of the site at a density of 50u/ha.
- **TYPE 4:** 3.8ha of mixed use housing at a density of 170u/ha.

4.5.2 Shopping Centre

As there is an existing Diepsloot Shopping Centre to the southwest of the proposed site, it was decided that the commercial area will be located on the northern extensions of the proposed development. There will also be smaller shops located throughout the proposed development which will be located as part of the social nodes. Business opportunities / space will also be provided along the main access roads.

4.5.3 Public Open Space

The public open space will be divided into 3 categories:

- a) The open space systems that are created by the layout / topography of the proposed housing units. These are small parks that almost function as a courtyard. This space is created by the layout of the housing units and forms a safe space between the housing units for social events and for kids to play.
- b) The second open space system is the natural wetland system which will form part of a larger 'natural' park system and will link with the existing Diepsloot system. The open space will be a combination of conservation area and active park areas.
- c) The third open space system will be the Giant Bullfrog Habitat area. This will be a combination of a conservation area and an active park and it is proposed that an environmental educational centre be built.

Please refer to Section 4.9 for more detail regarding the Diepsloot East Residential Open Space Systems.

4.5.4 Social Facilities

The Social facilities that will be included in this development will include the following activities:

- primary schools
- secondary schools
- sports fields and playgrounds will be provided as part of the school grounds
- crèche
- hospital / clinic
- community centre (hall, library, etc.).
- Place of Worship

These social facilities will be spread out through the proposed development as social nodes along the main access routes. The aim is to group the social activities together in order to create multi-purpose activities and thereby reducing travelling time and make the facilities more accessible.

4.6 Engineering

4.6.1 Civil Engineering

4.6.1.1 Sewer System

The development is located within the Diepsloot West sewer basin, which drains to the Northern Waste Water Treatment Works (WWTW). Johannesburg Water commissioned GLS Consulting to compile an assessment of impacts on sewer systems and required works. Their investigation was finalized and the master plans, as provided as part of the Services Report (Appendix C) forms the basis of the next sections:

Bulk Services and Supply Capacity

It is proposed that, due to the topography, the sewer for the northern portion of the property connect to the planned DN200/315 outfall at positions A & B as shown on Figure TG-S1 included as Annexure C4 of the Water and Sewer Services Report. The sewer from the southern side of the property will connect to the existing sewer reticulation system at position C as shown on Figure TG-S1 included as Annexure C4 of the Water and Sewer Services Report.

As indicated by GLC Consulting the future system analysis indicates that the existing system does not have the capacity to accommodate the proposed Diepsloot East Residential Development. The following upgrades are therefore required; refer to Figure TG-S1 included as Annexure C4 of the Water and Sewer Services Report:

- DSW_TANG2.3: Upgrade existing 250mm Ø outfall to 450mm Ø (820m);
- DSW_TANG2.4: Upgrade existing 300mm Ø outfall to 450mm Ø (900m);
- DSW_DSW2.1: Upgrade existing 150mm Ø outfall to 200mm Ø (approximately 415m);
- DSW_DSW2.2: Upgrade existing 150mm Ø outfall to 200mm Ø (272m).

At this stage it is also unclear whether the existing pump station at the Northern WWTW will be able to accommodate the additional 15 l/s from the proposed Diepsloot East Residential Development through connection point C. This will have to be investigated and confirmed.

Stand Connection and On-Site Sanitation

Johannesburg Water's "Service Level 3" will be installed in the development which means there will be a waterborne sewer connection to each erf with a connection to the top structures to be provided.

4.6.1.2 Water Infrastructure

The existing Diepsloot West Township was previously supplied from a trunk main from the Olivedale Reservoir and formed part of the Olivedale Water Supply Sub-District and has been experiencing sub-standard pressures. The Olivedale Water Supply Sub-District could not provide the existing Diepsloot West Township with adequate pressure, mainly due to the rapid development in the area and the associated increase in water demand.

In order to solve the problem, the existing Diepsloot West Township was incorporated into an independent Water District which is supplied from a Rand Water connection, from the existing Pretoriusrand Reservoir. There is however still a great demand on the existing system and therefore the Diepsloot Reservoir, Diepsloot Tower and the connection to the Dainfern Reservoir is currently proposed and in the planning phase. A part from this upgrade, which is in the planning phase, it was also recommended by GLS Consulting that a Tower be constructed in order to supply the high lying parts of Diepsloot East Residential Development and adjacent future developments.

Diepsloot East Residential Development – section to the north of the wetland

In order to service the high laying portion of the Diepsloot East Residential Development, located north of the wetland, as well as future developments located in the area to the west of the proposed site, it is proposed that a new DN 375 bulk main and 1600kl tower be constructed.

In the meantime, while the reservoir, tower and bulk pipe line are still planned, a temporary connection to the existing DN600 Johannesburg Water (JW) pipe line will be proposed. This pipe line runs along the wetland area on the northern part of the property.

Diepsloot East Residential Development – section to the south of the wetland

In order to service the southern section of the proposed development it will be necessary to construct the reservoir with a DN325 connection to the existing DN600 pipe line. A secondary connection to the Dainfern bulk pipe line (to be constructed within the next 2 years) is proposed to establish a ring feed to the existing DN 600 Diepsloot bulk pipe line.

4.6.1.3 Storm Water Management Plan

Currently it is a condition of township establishment, set by the Johannesburg Roads Agency (JRA) that the storm water discharge from any new township development is limited to a 1:5 year recurrence interval per development and that attenuation facilities should be provided to attenuate storms of up to 1:25 year recurrence interval post development.

Storm water will be collected and transported by means of an underground pipe system and discharged in the attenuation dam s/ ponds. The proposed storm water system is divided into infrastructure required to drain the minor storm water flood (1:5 year recurrence period) and the major storm water flood (1:25 year recurrence period).

The minor storm water system consist primarily of lateral kerb inlets, junction boxes, field inlets, overflow channels and pipe culverts. Pipe culverts vary in size from 450mm up to 1200mm.

The major storm water system primarily consists of pipe culverts, rectangular channels (covered and open), trapezoidal channels and portal culverts. The most common section, the rectangular channel, varies in width from 1.8m to 4.0m wide. These channels are placed in municipal stands or within road reserves. Channels in municipal stands are usually open, but are fenced off with 1.8m high “flat-wrap” barbed wire fencing. Rectangular channels in the road reserves are always covered.

As most of the storm water will be directed into pipes, less water will reach the wetland. To solve this problem it was suggested that the storm water be directed into the wetland and artificial dam. The storm water cannot be discharged directly into the wetland and to prevent this from taking place the following measures will be implemented:

- Water will be collected in attenuation ponds.
- The attenuation ponds will be built in such a way that the water will not be released directly into the wetland area.
- The attenuation pond will allow for over flow and the slow release of water into a swale area before reaching the wetland.
- The attenuation pond and swale area will be located within the first 10m of the proposed buffer zone.

4.6.1.4 Water Use License Application

One of the defining characteristics of the Diepsloot East Residential Development site is the wetland that is located on the northern portion of the proposed site. This watercourse falls within the Crocodile (West) and Marico, A21C catchment area. As a highly significant resource in South Africa water needs to be managed and conserved. In order to achieve conservation targets, processes such as water use applications are undertaken to ensure that water is used responsibly and efficiently. As such there is a water use license application process running concurrently with the EIA Phase of the proposed Diepsloot East Residential Development project. A report was compiled describing the characteristics of the watercourse as well as the various water use activities applied for. Impacts and mitigation measures as well as the effects that the water use activities will have on other users and the wider public, were also analysed. The water use license activities applied for, fall under Section 21(c) and (i), of the National Water Act (Act 36 of 1998), and include the ‘impeding or diverting the flow of water in a watercourse’ and ‘altering the bed, banks, course or characteristics of a watercourse’ respectively. The water use license application and technical report will be submitted together with the final EIA Report to the Department of Water Affairs (DWA).

4.6.2 Electrical Engineering

The proposed project falls within a supply area licensed to Eskom. An application for a supply of 32400kVA was lodged with Eskom. It was confirmed by Eskom that the supply will be available. Please refer to Appendix C for the letters received from Eskom. It was also confirmed by Eskom that they are planning for an 88 / 11kV substation and an 88kV overhead power line within the proposed township that will supply the development.

- Establish Diepsloot East substation on the site provided by the developer with:

- Install 2 x 88kV Line and Bus Bar Bays
- Install 2x 40MVA 88 / 11kV transformer (TRF) Bays
- 23m x 7.2m Switch House
- 8m x 4.2m Control Room
- Loop-in a line from Lulamisa by constructing:
 - 2.494km 88kV Double Circuit twin Tern line from Diepsloot East to a point close to Diepsloot Memorial Park and then split into a:
 - 0.490km Single Circuit Twin tern line that links into Klevebank Laezonia line and
 - 1.925km Single Circuit Twin Tern line to Lulamisa
- Establish an 88kV line bay at Lulamisa MTS

4.7 Traffic

The Traffic Impact Assessment (TIA) was conducted by Arup Transport Planning. The Fourways SATURN traffic simulation model was used to assess the traffic impact of the proposed development. The section below is only a summary of the TIA and the full TIA can be viewed as part of the Preliminary Engineering Design Report: Roads and Stormwater, Appendix C.

4.7.1 Existing Road Network

At present, the following roads surround the property:

- **William Nicol Drive (R511) / Provincial Road K46.**

William Nicol Drive / R511 is a north-south mobility spine that borders the western side of the proposed project site. This single carriageway mobility road connects to Randburg, located to the south of the site, and the N14 which is located to the north of the site. This road carries high volumes of traffic during peak hours and forms one of the main access points from Pretoria to Fourways.

- **Mnandi Road.**

Knoppieslaagte Road is a single carriageway local access road that gives access to areas such as Bridal Park. It forms an important link between the Summit Road (R562) and William Nicol Drive / R511.

- **Summit Road (R562).**

Summit Road is a single carriageway, local distributor road which connects the N14 to residential areas such as Blue Hills and Midrand.

- **N14.**

N14 is a major urban freeway accommodating mainly inter-regional traffic. It forms a strategic link between Pretoria, West Rand and Ventersdorp.

- **Diepsloot access roads.**

- **Main Road**

Main Road is a single carriageway access road to Diepsloot West from the William Nicol Drive / R511.

- **Gateside Avenue**

Gateside Avenue is a single carriageway access road to Diepsloot West from the William Nicol Drive / R511.

- **1st Avenue**

1st Avenue is a single carriageway access road to Diepsloot West from the William Nicol Drive / R511.

- **Ridge Road**

Ridge Road is a small gravel road that gives access to small holdings located just south of the proposed site.

4.7.2 Future Road Network

The following roads form part of the future road network planned for the area:

- **K46.**

Is a north-south arterial road, which will follow the current alignment of William Nicol Drive.

- **K54.**

Is an east-west arterial road which will provide a link between Diepsloot and Centurion. The K54 will have an interchange with the future PWV9.

- **PWV9.**

The proposed PWV9 is a planned north-south freeway to the east of the Diepsloot area. The PWV9 will start at the N1 in Bryanston area, with a system interchange. Current planning indicates that the PWV9 will terminate at the N14 but there is a possibility that it will link to the west of Pretoria. It is expected that the PWV9 will be tolled and will form part of the Gauteng Freeway Improvement System (Phase 2).

- **PWV5.**

Is an east-west freeway that will be located between the N1 and N14. The PWV5 is located to the south of the Diepsloot area and will link Fourways with Midrand. The PWV5 will have interchanges with the N1, PWV9 and the K46. The section of the PWV5 between the PWV9 and the R21 forms part of the Gauteng Freeway Improvement Scheme (Phase 2) and is expected to be complete in the medium term.

4.7.3 Road Upgrade and Mitigation Measures

The following upgrades were recommended to mitigate the traffic impact of the proposed development:

- Signalisation of the William Nicol Drive / R511 and N14 northern terminal
- One additional right turning lane at the southbound terminal of the William Nicol Drive / R511 and N14 interchange, westbound off-ramp
- Synchronizing of the:
 - William Nicol Drive / R511 and N14 southern terminal signals with the northern terminal signals;

- William Nicol Drive / R511 and N14 northern terminal signals with the northern access road signals;
- The northern access road signals with the southern road access signals;
- The southern road access signals with the William Nicol Drive / R511 and 1st Avenue intersection; and
- The William Nicol Drive / R511 and 1st Avenue intersection with William Nicol Drive / R511 and Mnandi Road intersection.

4.7.4 Site Access

The site will benefit from the two signalised access roads (Main Road and Gateside Avenue) from William Nicol Drive / R511. The two access intersections will have the following features as suggested by the TIA:

Northern Access: William Nicol Drive / R511 – Main Road

- From the site – a single carriageway with a separate left, straight ahead and right turning lanes;
- William Nicol Drive / R511 northbound – dual carriageway with a single separate left turn lane, double straight ahead and double right turn lane into the site;
- From Main Road – single carriageway with separate left, straight ahead and single right turning lanes;
- William Nicol Drive / R511 southbound – dual carriageway with a single separate right turn lane, double straight ahead and single left turn lane into the site.

Southern Access: William Nicol Drive / R511 – Gateside Avenue

- From the site – a single carriageway with a single right turn slot, single straight ahead and single left turning slot;
- William Nicol Drive / R511 northbound – dual carriageway with a single separate left turn slot, double straight ahead lanes and single right turn slot into the site;
- From Gateside Avenue – dual carriageway with separate left turn slot, single straight ahead lane and two right turning lanes;
- William Nicol Drive / R511 southbound – dual carriageway with a single separate right turn slot, double straight ahead and single left turn lane into the site.

4.7.4 Public Transport

It is anticipated that the proposed project will have more people using public transport than people using private transport. For this reason the following is recommended by the TIA:

- Taxi / bus lay bys are provided on site in support of appropriate guidance documents; and
- A taxi holding area will also be provided on site.
- In addition to the bus and taxi routes, City of Joburg plans to implement a BRT along William Nicol Drive / R511. This is however a medium to long term plan.

4.7.5 Non-Motorised Transport

A great percentage of residents staying in Diepsloot West Township and surrounding areas get to and from work by either walking (pedestrians) or cycling along William Nicol Drive / R511. There is currently no space available and therefore the pedestrians and cyclist use the unpaved road verge. There are also no proper crossings and people cross over William Nicol Drive / R511 at various points. The current upgrade of William Nicol Drive / R511, by the Steyn City Developers and Gautrans, allows for a shared pathway with a width of 2.5m for pedestrians and cyclist. This pathway will be carried through from the N14 southwards up to Steyn City. In order to allow for safe crossing over William Nicol Drive / R511 two pedestrian bridges will be built. These bridges will be situated at the two main access roads into Diepsloot West Township; Main Road and Gateside Avenue. The internal roads of the proposed development were also designed to cater for pedestrians and cyclist.

4.8 Waste Management Plan

The Waste Management Plan (WMP) for the proposed Diepsloot East Residential Development will be discussed in detail in the WMP (Appendix F).

The following WMP was compiled according to the specifications from both DWA and Pikitup. Please refer to Appendix C for the letters received from Pikitup and DWA. Pikitup indicated that they will be able to pick up the refuse from the proposed development. Residential 1 area will not have a refuse area and Pikitup will collect refuse from the individual properties. Each individual homeowner will be responsible for their own refuse bin and needs to make sure that the bin is stored in a safe place; animals are kept out of the bins and they need to make sure they place the bin on the kerb on collection day. An adequate refuse area will have to be provided for other areas of the development such as the shopping centre, business areas and the schools. The Council or its service provider will then pick up the refuse from the refuse collection area.

The waste generated during the construction phase will not be collected by Pikitup and should be disposed of in the correct manner and at the correct disposal facility.

Although Pikitup confirmed that they will be able to collect the waste generated by the development there are certain issues raised by DWA which needs to be addressed, please refer to Appendix C for the letter from DWA:

- *Records of waste disposal must be kept to ensure that waste is being disposed in an acceptable manner.*

During the construction period an Environmental Control Officer (ECO) will be appointed to ensure that the contractor complies with the EMP. During this period the ECO will also monitor the waste management plan to ensure that there is an adequate refuse area and to ensure that the waste is disposed of in an acceptable manner.

- *Systems must be put in place to ensure waste recycling and minimisation of waste production at the premises of the proposed development.*

During the construction phase of the development a recycling programme should be implemented to ensure that the generation of waste that are being disposed of is minimised. It is suggested that two areas be demarcated for waste disposal. One area will include all waste that cannot be recycled while the other area will include all recyclable waste. It is also suggested that the recyclable waste be sorted into different categories such as paper, plastic, glass & tin/ metal and that the appropriate parties pick up the recyclable items.

During the operational phase of the development, it will however not be that easy to regulate a recycling programme. It is suggested that recycling programmes be implemented at different public facilities, such as schools, shopping centres and community facilities.

- *No garden refuse will be allowed on a waste disposal site.*

This issue will be more difficult to regulate as there is no control over the garden refuse during the operational phase of the development. The onus is on the individual landowner to ensure that their garden refuse is disposed of in the correct manner. During construction phase it will be easier to manage, as the vegetation that was cleared from the site can be disposed of in the correct manner.

- *All organic and garden waste must be composted at the premises and used for soil enhancement.*

As mentioned above, this is not something that can be regulated during the operational phase as the onus is on each landowner to dispose of organic and garden refuse in a proper manner. This can however be suggested in the EMP and can also be implemented during the construction period.

- *All other waste should be disposed of at a permitted waste site.*

All domestic refuse from the residential areas will be collected by Pikitup and will be disposed of in the correct manner. During the construction period the building waste will be transported to a facility that can dispose of the waste in the correct manner.

Based on the information received from Pikitup and DWA the following Waste Management Plan (WPS) is suggested:

4.8.1 Construction Phase

During construction phase the following waste management should be implemented:

- Two areas should be demarcated as waste collection areas, one of which will be for non-recyclable items and the other for recyclable items.
- These areas should be approved by the ECO in order to prevent the areas from being placed in environmental sensitive areas.
- The recyclable items should further be sorted into the different categories for paper, plastic, glass, and metals (including food & drink tins).

- Adequate measures should be taken to ensure that there are enough refuse bins available on site and at the site office / camp.
- All building material should be recycled or reused if possible.
- No garden refuse is allowed in the refuse disposal areas.
- All vegetation removed during the site clearance phase should either be used as compost or should be disposed of at one of Pikitup's Garden Refuse Sites. Please refer to the vegetation clearance plan under section 4.10.3 Vegetation Clearance.

4.8.2 Operational Phase

During operational phase the following waste management should be implemented:

- Pikitup will collect refuse from the residential areas. Each owner will be responsible to leave their refuse bin on the kerb in order for Pikitup to collect it.
- The rest of the development such as the shopping centres, schools, businesses will have a collection point where the waste will be collected.
- As mentioned it is very difficult to ensure that each homeowner follows a recycling programme and that they dispose of their garden refuse in the correct manner. Certain things that can be done in order to make recycling a bit easier.
 - Recycling programs should be implemented at schools. In this way children will be able to learn from a young age how recycling works and why it is important. It is also easier for schools to have different competitions to motivate students to recycle.
 - Other recycling options are to implement different recycling bins (paper, plastic, glass, cans) at public areas such as the shopping centres, library, clinic, police stations etc.
 - As part of the environmental educational centre there could also be a recycling programme that can motivate kids to start recycling.
- It is also recommended that the shopping centre, businesses and the clinic have their own waste management plan in order to dispose of different waste in a proper manner.

4.8.3 Community Recycling Programs

Recycling programs must be considered during the operational phase of the project as both the community and the environment can benefit from these programs. There are currently existing programs within South Africa which is very successful and can be considered.

Recycle Swap-Shop:

This program encourages children to collect and sort recyclables "litter" within their community. The children collect the items and take it to a facility once a week, where the materials are weighed and exchanged for an item of their choice. The item they choose can either be a necessity such as toiletries, school uniforms or stationary or something they really want.

The recyclable materials are taken to a buy back facilities where the materials are sold and the capital made is invested back into the shop.

This program is beneficial for both the environment and the community as the children are introduced to educational processes and valuable life skills that are practiced and the environment is preserved and protected.

This Swap-Shop Recycling program was first started in Zwelihle in the seaside town of Hermanus in 2003. Since the start of this program more than 16 Swap Shops have been started in South Africa and form a network of projects that share ideas, experiences, challenges and successes. The program must be registered as a Non-profit Organisation (NPO) with the Department of Social Development which will grant the program access for funding and support.

This would be an ideal program to run in Diepsloot as there is a Buy Back facility located approximately 3km from the proposed site in Diepsloot West Extension 9, in Amos Street. The Recycle Swap-Shops can be situated at surrounding schools which would be easily accessible for the children.

<http://www.swop-shop.za.net/>

Recycling and Economic Development Initiative of South Africa (REDISA):

This initiative tackles the problem of waste tyres in South Africa. There is currently approximately 60 million tyres scattered around the country with no use or benefit to the community. These tyres pose a great threat to the environment as it is a substantial fire risk, breeding ground for vermin and an ideal breeding spot for mosquitoes due to the water retention.

The REDISA initiative is approved by the Minister of Water and Environmental Affairs and will not only deal with the pollution and health issues but also create opportunities for less fortunate people. Key issues surrounding this initiative are job creation and collection, transportation, storage and recycling of waste tyres.

The REDISA plan aims to remove waste tyres from the South African environment. The basis for this is to subsidise the collection and recycling process by attaching a value to the collecting of scrap tyres. Once there is that incentive, individuals and small entrepreneurs will seek out and remove tyres from their community and deliver them to a collection point.

A network of collection depots and recyclers will be established, and part of the operating cost of the REDISA plan will be devoted to training and support of the SMMEs. Another component will be allocated to Research and Development to create recycling processes.

<http://www.redisa.org.za/>

4.9 Public Open Space / Parks

Sufficient open space areas have been provided throughout the proposed development. There are currently three types of open space systems which include the wetland on the northern section of the site, the artificial wetland and dam on the southern section of the site (Giant Bullfrog Habitat) and the open spaces that are created by the different housing topologies.

The wetland system on the northern section of the proposed site mainly consists of a hill slope seepage wetland that supports the stream / drainage line. This wetland is a hydrologically non isolated, seasonal wetland which means that the wetland has a hydrological connection with a surface drainage wetland. This wetland area can be considered as an environmentally sensitive area. At this stage there are a few alternatives regarding the design of the wetland open space. Please refer to Section 8 with alternatives for the different options to design public open spaces.

The artificial wetland and dam on the southern section of the site is an important Giant Bullfrog habitat and will form part of the Giant Bullfrog Conservation Area. This area is characterised by an impermeable layer of hard plinthite rock and very shallow soils which results in the surface flow of water (water way). Due to the collection of water in an artificial dam the growth of favourable wetland plants and thus the creation of an artificial wetland occurred. This spot became an ideal breeding place for the Giant Bullfrogs. The wetland is within and below the artificial dam and then continues further down the property unto the next property where it eventually connects with other small rivers / streams supporting the Diepsloot river system. This area can also be seen as an environmentally sensitive area especially with the Giant Bullfrogs that occur on the site. It is suggested that this area be used as a conservation area with an active open space system and an educational centre.

The third type of open space system is the small parks that are created by the layout of the housing units within the development. These small parks that are created between the housing units are similar to small courtyards and forms a save space for social events and also for kids to play in. Although these parks / courtyards are open for public use it is not really a public open space but rather a small park specifically for the residents of the surrounding housing units.

4.10 Description of Biophysical Environment

This section provides a brief description of the existing biophysical and built/social environments. It draws on information from site visits, the study team and member's experience, background literature as well as maps, 1: 50 000, and photographs. In doing so, it presents a background against which the positive and negative impacts of the proposed options can be assessed. Existing social environment includes information regarding land-use and landownership, culture and historical aspects, etc.

4.10.1 Climate

Regionally, the site lies within the dry subtropical climate in the mid latitude of the world climate classification. The area receives most of its rainfall in summer with rainfall between 650 to 750 mm

per year. Temperatures vary between 7°C and 35°C for the summer and –5°C to 24°C for the winter months.

4.10.2 Vegetation

Vegetation within the proposed site for development is predominantly grassland, described in the latest Vegetation Map of South Africa, Lesotho and Swaziland as Egoli Granite Grasslands (Mucina & Rutherford, 2006). The dominant grass species that are found on site is *Hyparrhenia hirta*. This *Hyparrhenia hirta* – dominated vegetation community was disturbed in places by severe surface erosion and spatter erosion as a result of frequent burning followed by heavy rain. Small groups of trees and shrubs occurred sporadically. In the centre of the large area south of the drainage line, a specimen of *Acacia hebeclada* occurred together with small trees such as *Ehretia rigida* subsp *rigida* and *Rhus pyroides* var *pyroides*. A few small specimens of *Phytolacca dioica* (Belhambra) also occurred.

The vegetation along the drainage line was disturbed by severe surface erosion and the presence of many *Seriphium plumosum* plants, which in some areas dominated the vegetation community.

Footpaths bisect this terrain, considerable quantities of rubbish have been dumped and the lower part of the valley is badly fouled as it is being used as an open-air toilet.

Although the proposed development will have a definite impact on the vegetation cover of the proposed area, the significance of impact will be negligible since the vegetation in the study area has a low conservation status. The areas where the drainage line vegetation occurs will not be developed.

4.10.3 Vegetation clearance

During the construction phase most of the vegetation on site will be cleared. The only vegetation that will not be cleared will be the wetland vegetation and the vegetation that forms part of the Giant Bullfrog Habitat Area. Most of the plants on site are grasses with one or two trees. At this stage the grass on the proposed property is being used as an income for some of the people from the Diepsloot community. The grass is harvested and sold for thatching. It is therefore suggested that before the grass is cleared the community should have an opportunity to cut the grass in order to sell it for an income. It is also suggested that instead of using machinery to clear all the vegetation it should be considered to use intensive manual labour in order to create extra job opportunities for the local community. This could form part of a training program whereby individuals are trained to remove plants, especially some of the weeds and invaders. This could also form part of an Extended Public Works Programme from the Public Works Department.

Another issue that should be addressed before any construction and clearance of vegetation starts is the removal of the orange data plant species that was found on site. The *Hypoxis hemerocallidea* (African potato) should be relocated to a suitable conservation area such as the GDARD conservation area for medicinal plants. It is suggested that an ecologist or a Landscape Architect be appointed to

remove these plants. If the plants cannot be removed before construction starts the plants should be fenced off in order to protect them from construction activities.

Before any of these programmes can be implemented and before construction starts the environmentally sensitive areas must be fenced in order to protect these areas, this includes the African potato habitat.

4.10.4 Hydrology

The site has a seasonal drainage line. The development is likely to have a positive impact on the seasonal watercourse as the watercourse is highly disturbed and will be rehabilitated to form part of the open space area and increase the biodiversity of the area. The proposed wetland area will however be impacted by the road that will cross the wetland. The road will also have an impact on the hydrology of the stream.

On the southern section of the site is an artificial dam and wetland that were created by the collection of surface flow. The surface flow is due to an impermeable layer of hard plinthite rock and very shallow soils. The surface flow collected in the dam area, and its controlled release will form an ideal area or spot for wetland plants and encouraged the wetland habitat which will also be an ideal habitat for bullfrogs.

4.10.5 Sensitive areas

There are currently three sensitive areas on the proposed site. The first one is the Wetland Open Space area, the second is the Giant Bullfrog Conservation area located on the southern section of the site and the third sensitive area is the graveyard located more or less in the middle of the proposed site. Refer to Figure 4: Environmentally Sensitive Areas and Section 6: Specialist Studies for more detail regarding these sensitive habitats.

4.10.6 Site geology and soils

The site is underlined by Archaean granite and gneiss of the Halfway House Granite with typical leached, shallow, coarsely grained, sandy soil which is poor in nutrients (Mucina & Rutherford, 2006).

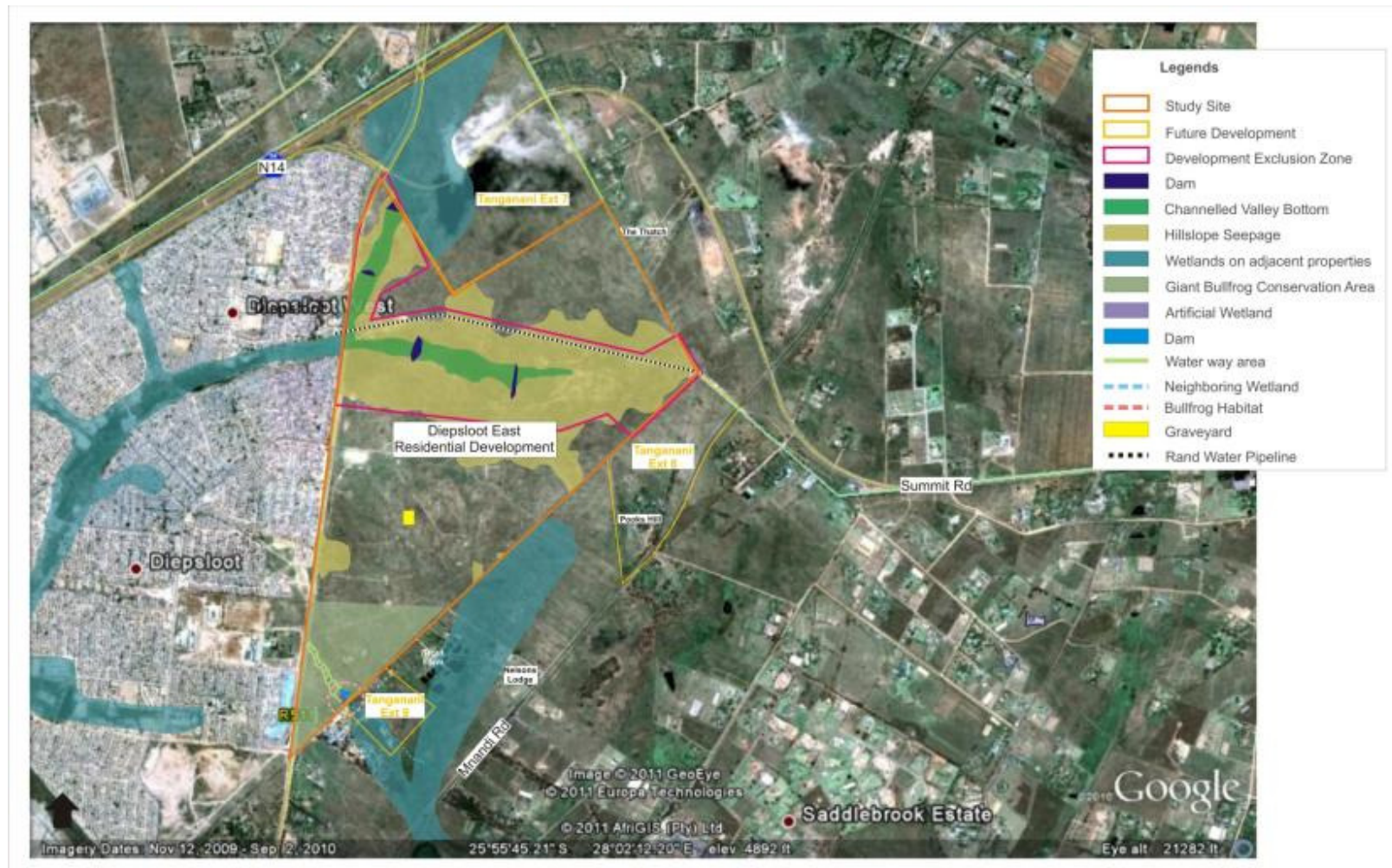


Figure 4: ENVIRONMENTAL SENSITIVE AREAS MAP: Diepsloot East Residential Development



Figure 4: Environmental Sensitive Areas Map.

4.11 Socio – Economic Environment

4.11.1 Land ownership

Gauteng Department of Human Settlement.

4.11.2 Agricultural Potential

According to the GDARD C-Plan 3 most of the area has a very low Agricultural potential. The only part that has a high agricultural potential is the Giant Bullfrog Habitat area. This will not be developed but will rather be used as an open space/ park.

4.11.3 Transport and Roads Network

The site for development is situated along William Nicol Drive / R511. To the north is the Summit Road (R562) and N14 Highway intersection and to the east is Knoppieslaagte / Mnandi Road. Apart from pedestrians, taxis are the main transport system that is currently being used. Refer to the Traffic Impact Study as discussed under Section 4.7 or the detailed study attached as Appendix C.

4.11.4 Social Environment

The surrounding social environment is a mixture of high income, low density residential areas with a good social infrastructure and a low income, high density township with a poor social infrastructure. To the west of the proposed site is the existing Diepsloot West Township. To the east of the proposed site are agricultural holdings which are mainly used for equestrian activities.

There is currently a lack of social facilities within the Diepsloot West Township. The City of Joburg appointed Maluleki Luthuli and Associates to draft an Urban Development Framework (UDF) for Diepsloot West Township in order to serve as a guideline for future planning in the area.

There is also a Diepsloot Government Precinct UDF that was drafted by APS Africa. The aim of this UDF is to upgrade the Diepsloot West area and to address the current lack of social infrastructure. Two important projects impact on the future development of the site:

- A Government Node in the north with a new school, library, community hall, transport facilities and infill housing;
- A district Node in the south with new schools, a library, community hall, clinic and transport facility.

There is currently one shopping centre (Diepsloot Mall) that serves the Diepsloot, Bridal Park, Knoppieslaagte area. The closest shopping centre or commercial area is approximately 9km from Diepsloot. There are also not enough schools, sport fields and other community facilities within the area.

There is a lack of health care within the area as the closest hospital is the Life Hospital in Fourways. There is no provision for primary health care like clinics within the area.

The Urban Development Framework for Diepsloot was consulted during the planning phase of the proposed Diepsloot East Development in order to establish exactly what type of social activities are required and how to group these activities together in order to create successful social nodes.

4.11.5 Economic Environment

Although there are business properties surrounding the proposed site there is a need for jobs / work within the Diepsloot Community. Businesses within the area include; to the south of the site is a construction business, car dealers, reptile shop and the Diepsloot Mall. There is also a Lodge to the east and a trout farm to the south east. Other activities in the area include the brick factory to the north of the site. The Diepsloot Mall is currently the only Mall within the area. There are smaller businesses within the Diepsloot West Township but these businesses are small businesses that are usually run from a house or from a venter along William Nicol Drive / R511. It also seems like the residents from the Diepsloot West Township are selling the grass from the proposed property in order to get an income.

Most of the residents from Diepsloot travel a long distance to get to work as the bigger commercial areas and working opportunities are located closer to Fourways (approximately 9km south of Diepsloot), Kyalami (approximately 10km to the southeast of Diepsloot) and Midrand (Approximately 15km to the east of Diepsloot). There are unfortunately not a lot of job opportunities within the immediate vicinity of the proposed project.

The surrounding communities (Dainfern Home Owner Association and Kyalami Ridge RA) and conservancies (GECKO & Renosterspruit Conservancy) together with Seeds of Africa and the Noweto Chamber of Commerce and Industry are working on a project whereby they are looking at creating jobs or providing jobs for the local community which includes Diepsloot. The aim of the Noweto Chamber of Commerce and Industry is to have a register whereby people can register their skills or local business. This register can then be used to source local labourers should job opportunities be presented. This is however still in process and more information will be provided as soon as a business plan is available.

5 PUBLIC PARTICIPATION PROCESS

Public Participation process is one of the most important aspects in the EIA process. It allows the public to have access to all information regarding the proposed development in hand through transparency and provision of sufficient and accessible information about the development. Public participation plays an important role in the compilation of an EIA Report as well as the planning, design and implementation of the project. Public participation is a process leading to informed decision-making, through joint effort.

5.1 Notification of I&APs

All registered I&APs were notified of the comments received from GDARD regarding the Scoping Report.

5.2 Registered I&APs.

All registered I&APs were contacted to confirm whether they would like to view and comment on the draft EIA Report. It was also requested that they should inform us in what format (hardcopy or electronic) they would like to view the EIA report. Please refer to the Table 4 below for the list of registered I&APs.

Table 1: Stakeholders identified during the Public Participation Process.

Government Departments	
Department / Organization	Contact Person
Department of Transport and Public Roads	Dennis Emett
Gauteng Department of Human Settlement	L. Ngcobo
Department of Water Affairs	
Municipalities	
Department / Organization	Contact Person
Johannesburg Road Agency	Hanners Grobler
Pikitup / Waste Collection	Danie Thorien
Johannesburg Water	Warren Longhow
Johannesburg Department of Housing	Uhuru Nene
Johannesburg Department of Development Planning	Lebo Molefe
Transport and Environment	
Johannesburg Environmental Department	Etienne Allers
City of Tshwane	Rudzani Mukheli
Services Providers	
Department / Organization	Contact Person
Eskom	Corporate Environmental Affairs Officer
Johannesburg City Power	

SAHRA Jennifer Kitto

Table 2: I&APs that registered during the Scoping Phase.

Diepsloot East Residential Development: Registered I&APs	
Name	Representing
Caroline A Yetman	University of Pretoria
Councillor John Mendelsohn	Ward 94 Councillor
Mr. J C Doak	Resident
Andrew Dicks	Resident
Mr Steve B Ireton	Resident
Shari de Nobrega	Greater Kyalami Residents Council Greater Kyalami Conservancy (GECKO) Ward 94 – Ward Committee
Gill Owners	Resident
Tony Stein	Resident
Mr Adrian Tills	Resident
Johan Crouse	Riding School
Stephen Louw	Saddle Brook HOA
Mr. Woods	Royal Park / Pooks Hill HOA
Philip Dieperink	Bridal Park HOA
Nicolette Wagner	Pooks Hill Hotel
Janine Nolting	GCS (Pty) Ltd
Carly Blankevoort	Resident
Julias R Katzke	Masingita Group of Companies
Pat van der Valk	
Paula & Lance Lasersohn	Resident
Claudia Cloete	Resident
Bernard Proper	Resident
Sipho	Resident
Allen Ramsay	Resident
Marius Cilliers	Resident
Dr. Karen Bohme	Resident
Sharon Boyce	Resident
Dudley Baylis	Resident
Amos Mulaudzi	SAHRA

Annette Deppe	Ward 93 Councillor
Frank Samuel Blackbeard	Resident
Bob Davidson	Resident
Mrs. D J Hughes	Resident
Chris de Villiers	Resident
M Heyneke	Eskom
Samukelisiwe Mkatshwa	Department of Water Affairs
Kim Kendal	Footloose Trout farm
S M Baikie	Dainfern Homeowner Association
Clive Varejes	Resident
Alta Tomaschko	Resident
Robyn Doak	Resident
Michael Bishop	Resident
Mark Corbett	Resident
Marion Clough	Resident
Andrew Dicks	Resident
Jan Engelbrecht	Resident
Alex Mitchell	Resident
Simon Beckett	Resident
Peter Wraight	Resident
Charles Foster	Resident
Renee Wilger	Resident
Rosemary Stapelton	Resident
Kristin Kallesen	Resident
Marlene Holzapfel	Resident

Public participation was adequately addressed during the environmental impact assessment process. Registered I&APs were notified of GDARD's response or comments on the Scoping Report. The registered I&APs were notified either through mail, email, fax or hand delivery of the information. Comments / concerns received were incorporated and addressed in this Environmental Impact Assessment Report.

Table 3: Main issues / comments raised by I&APs during the Scoping Phase.

Main Issues raised by I&APs	
Issues raised	Response/ Action
What exactly is the scope of the development, how many houses, density, what type of residential?	The residential development will include Residential 1 and Residential 3 land use, which includes medium density housing as well as high density low cost housing. The residential development will include for instance a shopping centre, schools, a clinic and parks.
Will the infrastructure support the development?	It has been confirmed by the engineers that water, sewer and electricity is available. Sewer is available for the first two phases of the development and the engineers are currently working on a plan to get sewer connected for the other phases of the development.
Will the development be fenced?	A fence will be erected around the development. At this stage <u>it is not sure what kind of fencing will be used.</u>
Will the social needs of the community be addressed?	Yes, the social needs will be addressed. There will be social nodes spread throughout the development. The social activities will include schools, clinic, library, community facilities, shops and sport fields.
What has been done regarding the traffic problem in this area?	ARUP (Pty) Ltd has been appointed to conduct a traffic impact study.
What about the wetland?	A wetland specialist has been appointed to conduct the wetland delineation study. The wetland will be

	used as part of a park. I&APs recommended that a horse trail run along the wetland. Regardless of the fact that the wetland will be part of a park there will also be smaller parks in the residential areas.
What will happen to the Bullfrogs?	<u>A Bullfrog Management Plan will be developed for the bullfrogs on the site.</u>
Safety	<ul style="list-style-type: none"> a) During construction phase all measurements will be taken to secure the site. b) A fence will be erected around the property to ensure that nobody enters the property. c) Crossovers will be built to ensure that pedestrians can cross safely from Diepsloot West to the Diepsloot East Residential Development.
Land Invasion	One of the main concerns of the councillors is the illegal invasion of land. They are currently working, together with the Gauteng Department of Human Settlement, with the public to ensure that they are aware of the new development. This is a measure of trying to inform people of the development and in this way prevent land invasion.
You should be aware that residents have been fighting the PWV 5 & 9 for many years and will continue to do so. These are proposed roads - not planned roads - so should not form part of your planning and validation process.	Although the PWV 5 & 9 roads are just proposed roads these roads should be taken into consideration as it will influence the overall traffic of the entire area.
The majority of residents object to the K56. Urgent discussions need to take place with relevant parties and RA's before proposals are made to build the single carriage. City of Joburg has insufficient budget to expropriate land for the K56 and the current proposals are flooded. A local resident, Mr.	Are you referring to the K54? Unfortunately this situation is out of our hands as we are not responsible for the development of these roads. This issue should be discussed with JRA / Gautrans.

Malcolm Mackenzie has viable alternatives that have been studied by road engineers, traffic engineers, the AA etc and we would be happy to impart this information as an alternative.

The internal link between Cedar and the R511 must be reconsidered as a public route and form part of the BRT plans. It will alleviate major traffic through the Fourways area!

The upgrade of the R511 must include the widening of the bridges over the Jukskei River and Diepsloot River to accommodate all lanes.

No specific mention has been made of BRT routes, taxi ranks, bus stops and how these will integrate with surrounding suburbs and nodes. This is a fatal flaw, but we would welcome the opportunity to discuss the oversight in conjunction with envisaged public transport proposals for the Greater Kyalami area.

Please advise whether the available water will be municipal or borehole. If it is borehole, we have major objections

Please indicate if a long-term environmental management plan will be implemented for the seasonal wetland/proposed open space between the business area and residential area and who will be responsible for monitoring and implementing the plan.

What plans will be implemented to retain/preserve/ or responsibly relocate the remaining Egoli Granite Grassland on site.

This will be discussed as part of the traffic impact study.

This will form part of the traffic impact study and suggestion to the engineers working on the upgrade of the R511.

This issue will form part of the traffic impact study.

Municipal Water.

This is an issue that will be mentioned in the EIA Report. Sometimes GDARD does ask for a management plan for the open space, which is usually a specific condition before construction can start. Unfortunately we do not know who will do the monitoring, this depends on who the Developer appoints.

Unfortunately the Egoli Granite Grasslands are totally destroyed. When rehabilitating the area especially the wetlands indigenous vegetation will

	be used but unfortunately it will only be a section of the development.
Please clarify whether you will be constructing to the 1:50 or 1:100 year flood line.	We will be constructing to the 1:100 flood line. This line and the wetland buffer line are more or less the same and we are <u>not allowed to construct within the wetland buffer.</u>
Please clarify the exact nature and distances of the buffer zone of the wetland-preferably with a diagram or map.	Please refer to the wetland report and the Environmental Sensitivity Map (Figure 4).
No information has been supplied with regards to <u>green building methods, energy saving, water saving or indigenous landscaping.</u> All are integral to sustainable development and global warming issues, especially in light of recent comments by Eskom and various government officials. Will developers be addressing these needs? If so, please provide full details.	These issues are usually addressed at a later stage but will definitely be addressed. We were presented at a meeting where they discussed how climate change/ energy saving can be incorporated into the EIAs. Although climate change is not a required issue that needs to be discussed in an EIA Report it is becoming a sensitive issue, which should be incorporated into all EIA Reports. We will definitely have a look at it.
Concerned about the traffic, electricity and sewerage.	A Traffic Impact Study was conducted to address these issues. Engineers were be appointed to address the sewer and water availability for the area.
Concerned that there will be no more open space left in JHB.	Provision will be made for open spaces in this development
Requested a locality plan indicating the natural features on site.	A locality plan indicating the natural areas was sent (See Fig.1& 2).
What percentage of the development will be housing, mall, roads etc.?	Unfortunately the % cannot be determined, as the layout has not been finalized.
Concerned about property value that might plummet.	The property values might not necessarily decrease but might show an increase.

Concerned about the ecologically important plant and animal species that might occur there.	A <u>habitat study has been conducted</u> and we are currently working on a Bullfrog Management Plan.
Not satisfied with the public participation process that was followed.	It was explained to Sharon that the <u>EAP followed all the steps as set out in the NEMA regulations.</u>
It was requested that a Heritage Impact Assessment (HIA) be conducted.	<u>A HIA study was already conducted</u> and we are just awaiting the final report.
A formal taxi holding area should be included in the development.	The <u>taxi area will be incorporated</u> into the layout of the development.
A formal trading area should be included. Insufficient schools, clinics, libraries, police stations.	A trading area will be incorporated. There will be schools, libraries and a clinic in the developed area. A new police station was built across the road in Diepsloot.

As part of the public participation process for the EIA phase, a public meeting was held with I&APs on 30 November 2010 and a follow up meeting was held on 22 February 2011. Please refer to Table 7 below for the main concerns that were raised during the Public Meeting. The Minutes of the meeting is attached as Appendix D.

A third public meeting was held with the Diepsloot community on 15 March 2013. There is unfortunately no minutes but the attendance register as well as the presentations are attached as Appendix D.

A forth public meeting will be held with the community either the last week of September 2013 or the first week of October 2013. The date will however be confirmed.

Table 4: Main Issues / comments by I&APs during the Public Meeting held on 30 November 2010 and 22 February 2011.

Main Issues raised by I&APs	
Issues raised	Response/ Action
URBAN DESIGN FRAMEWORK	
PWV9 and PWV5 are indicated on the plans, were these not removed off the SANRAL plan completely, as well as land set aside for servitudes? How was the public involved in the route determination process, as the development is encroaching into conservancy areas?	The PWV5 and the PWV9 are both roads that will be managed by SANRAL. The route determination will therefore be completed by SANRAL and is not the responsibility of the Gauteng Department of Human Settlement. All roads and other servitudes must follow an EIA process before construction can begin.
What criteria will be used for controlling development? Will buffers really be adhered to, or is this just a “concept”?	Criteria for development include housing development and occupancy according to earning brackets. Lower income housing will be subsidized by higher income developments – there is a strategy for controlling development, it will not happen in an uncontrolled fashion. Guidelines will be written for the development.
What is the criterion for the buffer zone?	The criteria will be looked at in more detail in the final Urban Design Framework.
What is the sequence of development?	The development is divided into three phases. The first phase to the north of the wetland will be developed in conjunction with the main access route to the development. Phase 2 and 3 will only be developed at a later stage and in conjunction with the main access routes to the south of the wetland system.
Will roads and other infrastructure be in place first?	Yes.

What is the percentage of land uses i.e. What percentage is commercial and what percentage is rental?	<p>1000 units – bonded units</p> <p>1200 units – rental flats</p> <p>1200 units – combined commercial walk up</p> <p>1400 units – courtyard housing</p>
How will existing residents be protected?	For security reasons a fence will be put up once construction begins.
Comment: Request that a security plan be developed and made available concerning construction and all related activities, as well as a management plan for contractors concerning staff and the living and transport arrangements.	The City of Joburg is responsible with the assistance of the Wards Councillor to control the construction activities.
Will it happen as one bulk application or various applications?	One entire application, development however will be broken into phases according to availability of services.
Will hospitals and schools cater for the overflow that Diepsloot is experiencing?	The schools and social developments will cater mostly for the development itself, the hospital will cater for a greater area.
There is no need for more shopping centres and schools in the area	Commercial Properties, and Schools are provided for in the layout as per Gauteng Department of Education's (GDE) Guidelines
Are there going to be 10 000 units / people?	There will be 8 000 units x an average of 4.3 people
How will the development of backyard shacks be curbed?	The stands have been reduced to an average of 110m ² . GDHS will be constructing formal structures on at least 60m ² of the stand, leaving very little space left for backyard shacks. In addition each RDP unit will be constructed with a formal rental unit attached which will dissuade the beneficiary from creating informal backyard rental shacks.

What is happening with parking? The tarmac areas will create a lot of runoff.	Adequate parking is catered for within the properties, as prescribed by City of Joburg's Bylaws. Tarmac areas will create a lot of runoff which will be managed by the various attenuation ponds inside the project property.
What surfaces will be used for the parking areas?	Grass blocks and other permeable surfaces are being considered. Alternatives are being considered.
Can this project be compared to Cosmo City?	Yes in terms of the mix of housing types, but the aim is for a better product. Learnt from previous mistakes and experiences. Pennyvale is also an example.

TRAFFIC

Requested that the development be made conditional upon the R511 being upgraded. R562 must also be upgraded first. People that will be living in the development and who work in Pretoria and Midrand will need to travel along these routes. Although this is the responsibility of the Government, development must still be made conditional.	Refer to the Traffic Impact Assessment regarding the upgrade of the surrounding road network.
The PWV 9 and PWV 5 have been proposed since 1973, it does not seem like a reality.	The philosophy for the development is that money generated from existing toll routes will fund the proposed routes. The routes are on the plan for a reason, however they will happen according to realistic timelines. Planning process will take approximately 6 years.
Suggestion that all developers put funding into one account for R511. The R511 is vital and must be developed to reduce the pressure that the taxis place on the rest of the areas.	

Budget was available for the R511 before the elections, but now it has disappeared. Where is it now? Promises were made that it was available.

Will provision for taxi ranks be made within the development? Opinion was given that the developer must build taxi ranks within the proposed development.

The taxi ranks are too informal. They should be in a building with proper control and services.

Provision will be made for taxi rank at shopping center and hospital.

That would be a taxi holding area and not a taxi rank. But comment has been noted.

ENVIRONMENTAL

When did the EIA process start?

The EIA started in 2007; the existing report is being incorporated and built upon for the current EIA process. GDARD confirmed that this is acceptable as the layout and contractor have changed, but *not* the land use activities which were applied for.

If fences allow faunal species to move through, how will they prevent people from moving through? This must be addressed in the security plan. A more permanent and effective solution needs to be arrived at. Security company to guard the fence would be ideal.

The proposed fence will allow for the movement of small animals, specifically the movement of the Giant Bullfrogs. During the construction period a security company will be appointed to secure the area.

How is stormwater management being addressed? There have been too many bad examples of stormwater problems in other areas.

A proper storm water management plan was developed by Bigen Africa Engineers.

SERVICES

There is currently a shortage of water for residents to the east of Diepsloot.

This area receives their water from Blue Hills Reservoir. As soon as the Diepsloot reservoir is up and running this area will receive water from the

	new reservoir.
Diepsloot Reservoir <u>must</u> be in place and working before Diepsloot East can be build.	This condition will be part of the condition of establishment as agreed upon by City of Joburg and the developer. The project shall be phased into two phases, with the second phase only commencing once the reservoir has been completed. This is also a requirement of Johannesburg Water, and the supply constraints and mitigation measures thereof are managed by them.
Who will control the construction activities and insure that no development starts before water is available?	The City of Joburg is responsible with the assistance of the Wards Councilor to control the construction activities.
The EIA should only get approved once City of Joburg has approved <u>all</u> the services.	All services have been designed as per CoJ guidelines, and have been commented on and approval is pending as part of the parallel township establishment processes.
From the locality map it looks like the sewer pipeline will go through the wetland.	The sewer pipeline will not go through the wetland area. Just from a technical point of view it is not practical and from an environmental point of view it is not allowed.
Will the WWTW be able to cope?	The WWTW is currently undergoing upgrades and will be able to cope with the sewage from the new development.
Will the bulk contributions of the development stay within the development or will it be used for something else?	The bulk contributions of the development will be used as a 'set off' for providing service infrastructure to the development. This agreement will be between the developer and City of Joburg.
The conditions of approval for the development MUST include that the development can only go ahead once the substation is built and in working	The Substation is not an essential part of the development for subsidised housing. Nonetheless GDHS has already agreed to Eskom's budget

order.	quote for the substation, which Eskom will proceed to develop. Please be advised that the substation is not part of the environmental process for Diesploot and therefore Eskom will have to do their own environmental assessment.
People staying in Timsrand will have more power outages as Eskom doesn't cope with the electricity demand in the area.	A new substation will be constructed as part of the project, and no electrical connection will be made to the existing grid.
The electrical supply infrastructure and the electrical supply capacity will have to be upgraded to cater for the increased demand	This is underway; a budget quote was given by Eskom for the substation and already accepted by GDHS.
What will be done regarding the waste generated by the development	The waste management will be as per PikitUp's guidelines, who have reviewed and commented on the development. Also refer to the Waste Management Plan.

SOCIAL

Crime is a major problem in the area and the proposed development is likely to exacerbate an already serious crime problem, especially during construction. Should this development go ahead, the residents would require that "The Valley" residential area should be walled off in order to keep criminals out.	GDHS will take this into consideration and investigate the possibilities of walling the project property. The proposed development will be fenced but proper research needs to be done regarding the fence as it needs to comply with the management of the sensitive environments.
Impact negatively on Timsrand's safety and security with an increase in crime concomitant with the close proximity of high density housing. A wall should be built to fence of the new development.	GDHS will take this into consideration and investigate the possibilities of walling the project property. The proposed development will be fenced but proper research needs to be done regarding the fence as it needs to comply with the management of the sensitive environments.
How will existing residents be protected? Request that a security plan be developed and made available concerning construction and all related	The project proposes the appointment of a security consultant who will prepare and manage the security plan for the project during construction.

activities, as well as a management plan for contractors concerning staff and the living and transport arrangements.

The area already has a huge proportion of low density housing in terms of Diepsloot / Tanganani to the west and Olievenhoutboch to the east, all of which has brought an influx of people over the past decade. There are limited work opportunities in the immediate area and transport remains a major cost factor and challenge for residents of the aforementioned areas.

Reduce the value of properties in Timsrand which is zoned for low impact residential & agricultural holdings of no less than 2.5 hectares in size, and in quiet rural setting

What will this development do to the property values of residents directly bordering on it as well as the property values of residents in Mnandi, Bridle Park, Glenferness, Kyalami, Blue Hills etc (in close proximity to the development)? This is also relevant if one considers the equestrian nature of all these communities and the potentially negative impact the development will have on this as well as the very healthy equestrian industry that creates much needed employment. I make this association as residents may be forced to sell their properties.

The traffic has been addressed as part of the TIA and certain upgrades were recommended to ensure that the traffic flow in the area is better. Work opportunities will be addressed by providing jobs for the local labourers during the construction period. This will not solve the problem but will assist in making a difference. It is also recommended that programs such as the one done by GECKO, Dainfern HOA and Noweto Chamber of Commerce and Industry are supported.

The development aims to eradicate the Diepsloot West Township. GDHS are of the opinion / view that the reduction in informal building will actually have a POSITIVE impact on surrounding property values.

In addition to the above the type and quality of the residential units to be constructed as part of this project, wherein nearly double the usual housing subsidy will be utilised should produce a development that will not reduce property values in the area.

The draft EIA Report is currently circulated to all registered I&APs. Registered I&APs have 40 days to comment on the draft EIA Report. A fourth Public Meeting will be held in order to discuss the Environmental Impact of the proposed project. The date for the Public Meeting will still be confirmed.

Table 8 below will be completed once the comments were received from both the public meeting and review of the draft EIA Report.

Table 5: Comments by I&APs after reviewing the EIA Report.

6 SPECIALISTS STUDIES

Some of the specialist studies were conducted and submitted to GDARD under the ECA regulations, there were however new issues that required further investigation. Please be advised that all the specialist studies were included in the EIA Report and will be submitted as part of the Appendices. The following specialist studies were conducted:

1. Fauna and Flora survey.
2. Giant Bullfrog Management Plan.
3. Wetland Assessment.
4. Heritage Impact Assessment (as requested by SAHRA).
5. Landscape Development Plan.

These specialists studies together with the criteria used to assess the environmental impacts will be used to describe the overall impacts the development might have on the environment, what mitigation measures should be used to decrease the environmental impacts and to discuss any alternatives.

Please be advised that all the specialist studies are attached as Appendix E.

6.1 Flora and Fauna Study

6.1.1 Flora

During the vegetation study two vegetative communities were identified, please refer to Figure 5: Vegetation Communities:

- *Hyparrhenia hirta* grassland; and
- Eroded drainage line vegetation.

***Hyparrhenia hirta* grassland**

This *Hyparrhenia hirta* – dominated vegetation community was disturbed in places by severe surface erosion and spatter erosion as a result of frequent burning followed by heavy rain.

The species diversity of this large vegetation community was not very high with a total of 58 indigenous plant species recorded on the entire area. Small copses of trees and shrubs occurred sporadically. In the centre of the large area south of the drainage line, a specimen of *Acacia hebeclada* occurred together with small trees such as *Ehretia rigida* subsp *rigida* and *Rhus pyroides* var *pyroides*. A few small specimens of *Phytolacca dioica* (Belhambra) also occurred (invasive to South Africa Category 3).

The *Hyparrhenia hirta* grassland was deemed to be disturbed Egoli Granite Grassland and was not considered sensitive.

Disturbed drainage vegetation

The vegetation along the drainage line was disturbed by severe surface erosion and the presence of many *Seriphium plumosum* plants, which in some areas dominated the vegetation community. In places, the drainage line formed a wetland, especially above and directly below an embankment made across the drainage line.

The species diversity of this vegetation community was not very high with a total of 55 indigenous plant species recorded. Five alien species were recorded, all of them inoffensive species, except *Melia azedarach* (Syringa), which is a Category 3, Declared invader. One small copse of Syringa occurred in the drainage line vegetation.

Connectivity existed with the grassland on the site and the drainage line south of William Nicol Drive / R511. Because drainage lines form corridors for the movement of species, which include pollinators of plant species. The vegetation along the eroded drainage line was considered sensitive.

During the site visit one Orange listed plant species (*Hypoxis hemerocallidea*, African potato) was found. The African potato was found near the corner of the eastern half of the site, north of the drainage line, about 100 African potato plants occurred (co-ordinates S25° 55' 29,6" / E28° 02' 10,5"). These plants should be relocated to a safe, suitable area, such as the conservation area for medicinal plants maintained by GDARD.

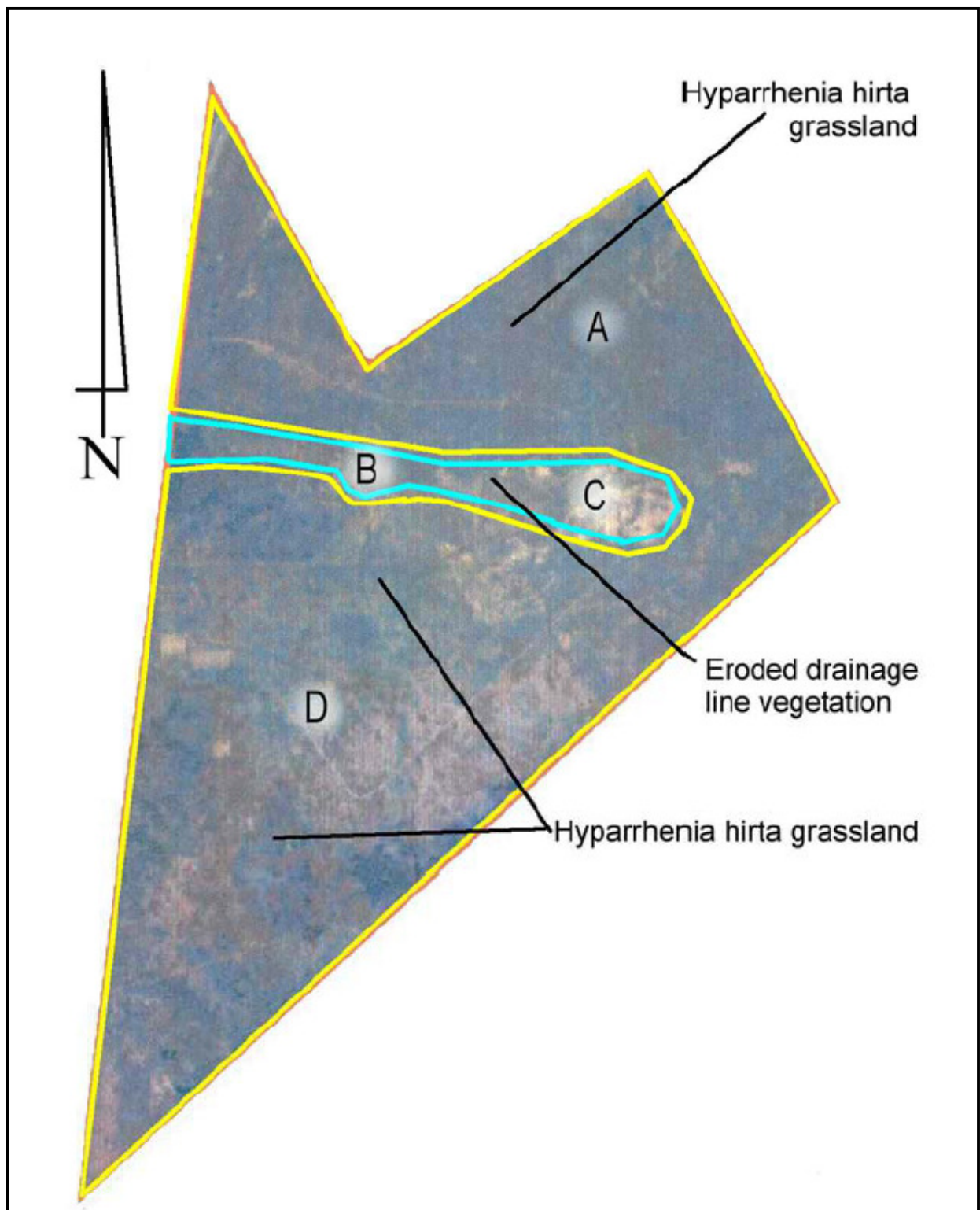


Figure 5: Vegetation Communities as per the Fauna & Flora Report.

6.1.2 Fauna

During the Fauna study it was found that two major habitat types are present on the site.

- Terrestrial: The site is nominally classified as Rocky Highveld Grassland (Low and Rebelo, 1996), as such with topography of rolling plains. At present, the basal cover consists of tall grass, but towards the east, erosion is in an advanced state because of annual burning of grass and detritus. At places, erosion developed into deep dongas, and further towards the west the water flow has been dammed with earthen walls.
- Wetland: Two of the areas in the wetland contain water, but it is clearly a seasonal phenomenon since wetland components are absent with the exception of *Phragmites* reeds.

The diversity of mammals is low, and consists of an assemblage of common and widespread terrestrial species with wide habitat tolerances. This is in part due to the homogenous (grassland) nature of the site; even though some water is present in the erosion donga and two of the dams, semi-aquatic vegetation as mammalian habitat are absent. There is a high degree of human pressure on the site, especially from the Tanganani and Diepsloot West Townships. The adjoining roads and the security wall act as dispersal barriers for *inter alia* medium-sized mammals such as duiker and steenbok, whereas the substrate is compacted and gravelly as such obviating the occurrence of discerning burrowers such as springhare, aardvark and golden moles.

The site does not have rupicolous or arboreal habitats, whereas the water environment does not support semi-aquatic vegetation of note, and as mammal habitat should therefore be rated as absent.

Only one distinct bird habitat system was identified and that is the grassland habitat. The grassland is however very disturbed and will only favour the more common ground living bird species such as lapwings, francolins, pipits, long claws, larks and chats that either hunt for insects or breed on the ground, in burrows in the ground or between the grasses. Weavers and widow-birds will make use of this area for feeding (seeds) during late summer and early winter when the grass is not burnt and widow-birds and cisticolas will also breed in the tall grass during summer. Aerial feeding birds such as martins, swifts and swallows will hunt for insects over the grasslands. Some scattered *Eucalyptus* trees can be found in isolated areas especially on or close to the border of the site.

The drainage line that runs through the property and the small impoundment within the drainage line is unlikely to keep water for a long period of time due to the slope of the site and low water retention abilities of the soil. No sensitive areas with regards to Red Data bird species could be identified.

Although the habitat is very disturbed, Giant Bullfrogs occur on site. If shallow breeding pools can develop, the area could be suitable as dispersal area for the Giant Bullfrog. The Giant Bullfrog, which is known from this site, requires shallow pans, which last at least 3 weeks, for completion of the

metamorphosis. The vast numbers of frog-lets must be able to disperse as they are voracious feeders and highly cannibalistic. In order to survive, they must space themselves out individually and find suitable substrate into which they can burrow and bury themselves.

To provide the population of Giant Bullfrogs on site with the opportunity to survive, it is essential that a section of the site, suitable as dispersal area, surrounding and in conjunction with the three pans, be retained as a conservation area.

6.2 Giant Bullfrog Habitat Assessment

The proposed Giant Bullfrog habitat, on the southern corner of the property, was currently part of a doctoral study undertaken by Caroline Yetman from the University of Pretoria. It is for this reason that we've appointed both Caroline Yetman and Vincent Carruthers to make suggestions regarding the protection and conservation of the Giant Bullfrogs and to compile an Environmental Management Plan (EMP) for this specific site. Please refer to Appendix E for the comments from Caroline Yetman and the EMP from Vincent Carruthers.

The Giant Bullfrogs is "Near-Threatened" in South Africa, and the Giant Bullfrog population present on the site represents one of the two potentially viable populations of the species between Pretoria and Johannesburg. According to Caroline's studies the Giant Bullfrog population has revealed that the adults in the population are concentrated around three seasonal pans situated to the south of the site. The three seasonal pans include the artificial dam and wetland area on the proposed site and the wetland on the neighbouring property (Portions 97 & 100 of the Farm Diepsloot 388 JR) to the southeast of the artificial dam. In order to protect all the adult bullfrogs it will be necessary to demarcate a **1km buffer zone** around these breeding ponds. This is however not achievable as the properties to the northwest, west, southwest, south, southeast and the east are already developed or are demarcated for future development. This leaves the area to the north and northeast of the breeding pans which is the proposed site for the Diepsloot East Residential Development. The only other movement for the Giant Bullfrogs is to the southeast through the adjacent wetland corridor towards the river.

The proposed Diepsloot East Residential Development property is currently under threat as there is a great demand for housing in this area and the site is an ideal site for new houses. This demand for housing leaves the sites open to the potential invasion of illegal settlers, which automatically places the Giant Bullfrog population under threat. We also received word that there might be a possibility that people living in the area are catching the bullfrogs for food. It was thus critical that we develop a management plan for the protection and conservation of the Giant Bullfrogs not just from the future development in the area but also from people currently living in the area.

Caroline suggested the following three alternatives as conservation measures that could be implemented for the Giant Bullfrogs:

Option 1: *In situ* (on site) protection of the Diepsloot bullfrog population.

This option will require that no development takes place on the land that the bulk of the bullfrog population depends on for breeding, foraging and burrowing. Based on the findings of radio-tracking research on the bullfrogs a large buffer zone (hereon referred to as Buffer Zone 1) should be declared around the breeding site for protection of the resident bullfrog population. Caroline suggested that from conservation management perspective Buffer Zone 1 represents probably the least complicated, least invasive and least risky strategy to try to sustain the persistence of the bullfrog population. If Buffer Zone 1 were to be established it is suggested that developing programs (or possibly a full-blown centre) for environmental education/training, recreation, eco-tourism, and/or limited resource extraction (of e.g. thatching grass, medicinal plants, etc.) should be established at this site. Such a venture would surely benefit the Diepsloot community (in terms of social and economic upliftment), and even the greater Midrand area.

A second proposed buffer zone (hereon referred to as Buffer Zone 2) was also suggested by Caroline and is indicated by green outlines in Figure 6. Buffer Zone 2a (indicated by the light green outline) is expected to protect roughly 65% (i.e. 90% of males and 40% of females) of the bullfrog population. Buffer Zone 2b (indicated by the bright green outline) is a better alternative and is expected to protect roughly 80% (i.e. close to 100% of males and 60% of females) of the bullfrog population. Buffer Zone 2c (indicated by the dark green outline) is the most preferable alternative and is expected to protect roughly 95% (i.e. close to 100% of males and 90% of females) of the Diepsloot bullfrog population. Note that Buffer Zones 2a-c *cannot* be reduced any further in size. Firstly the buffer zones are considerably smaller than what they should be as a consequence of the surrounding road network. Frogs generally require highly specific microhabitat conditions that are typically poorly understood and are difficult to identify/predict across a large landscape.

The bullfrog population is unfortunately confined to a triangular (as opposed to a circular or square) piece of land and thus cannot be afforded as a very conservative protection. Secondly, the spatial habitat requirements of sexually immature bullfrogs are not known. Increasingly more studies show that most sexually immature individuals of amphibian species populations disperse considerably farther from the breeding sites compared to most adult individuals. Therefore, while proposed Buffer Zones 2a-c may be more or less adequate for protection of most adult bullfrogs at the Diepsloot breeding site, these buffer zones may not be sufficient to protect the majority of resident sexually immature bullfrogs. Thirdly, the smaller the buffer zone, the smaller the protected population and the greater it's susceptibility to "edge effects," genetic drift, inbreeding depression and extinction. The bullfrog population should therefore be protected within the *largest possible* buffer zone.

The major concerns regarding proposed *in situ* protection of the Diepsloot bullfrog population include:

- the size of the buffer zone.
- construction and *continued maintenance* of an extensive, tall, sturdy concrete wall that neither people nor bullfrogs can penetrate.
- edge effects (e.g. pollution) along the periphery of the buffer zone.
- deleterious demographic and/or genetic consequences of population isolation and small population size, which are
- likely to necessitate active management of the protected population to ensure its *long term* persistence.
- the impact of future developments immediately around the site on local run-off, and consequently the hydroperiod of the seasonal pans that the bullfrogs require for breeding.
- increased pressure to develop the site as land becomes scarcer and housing demands increase with time.

Option 2: Relocation of the Diepsloot bullfrog population.

This option will permit development to take place upon the whole of Portions RE/2 and 123 of the Farm Diepsloot 388 JR once as many as possible individual adult bullfrogs and their offspring have been relocated to one or more new locations. Unfortunately most documented studies of frog relocations indicate that the relocation of adult frogs is often **unsuccessful**. This is because:

- Adult frogs are typically highly philopatric (i.e. they breed at the same site (usually their natal site) throughout their lifetime).
- When relocated to a site that is too close to their site of origin, adult frogs often try to make their way back “home”.
- When relocated to a site that is sufficiently far away, the frogs become disorientated and apparently struggle to find suitable habitat/microhabitat conditions, sufficient prey, etc.

Under these circumstances relocated frog populations generally experience low survival, poor reproductive success, and short-lived persistence. Alternatively, relocation of a frog population's eggs, tadpoles and/or newly-metamorphosed froglets is more strongly recommended. Note however that when this is done it is *critical* to first let the new location become imprinted on the relocated offspring before they are set completely free. This can be accomplished for example, by placing the offspring inside mesh wire cages that are positioned in the new breeding site, where microhabitat conditions are most favourable for tadpole development.



Figure 6: Bullfrog Sensitive Areas.

The major concerns regarding proposed relocation of the Diepsloot bullfrog population include:

- where exactly the frogs should be relocated to. (Recommended sites include Rietvlei Nature Reserve, Diepsloot Nature Reserve, and/or Glen Austin Pan – in decreasing order of preference).
- securing permission to release the frogs at the desired location(s).
- successful acquisition of the required permits.
- the unpredictability of bullfrog breeding events.
- the risk of adversely affecting bullfrogs that are already resident at the chosen location(s) (e.g. by causing overcrowding a skewed population sex ratio, increased cannibalism, and/or by introducing chytridiomycosis – a fatal infectious disease that affects amphibians, caused by the chytrid fungus *Batrachochytrium dendrobatidis*).
- the resources (*especially* the money and manpower) required to catch, transport, mark, rear and monitor the relocated animals.
- stress, disorientation, reduced reproductive success and increased mortality that the relocated animals are likely to suffer and which could result in rapid extinction of the Diepsloot bullfrog population.

Option 3: Gradual relocation of the Diepsloot bullfrog population.

This option will require that no development takes place on the land that the bulk of the Diepsloot bullfrog population depends on for breeding, foraging and burrowing for at least the next 3-5 years, during which time as many as possible individual adult bullfrogs and their offspring are to be relocated in a graduated fashion to one or more new locations. This strategy is still not as preferable as conservation management Option 1, but it is at least a lot less risky than Option 2. If attempts to relocate individuals from the Diepsloot bullfrog population during the first 3-5 years prove highly unsuccessful, the option to protect the population *in situ* should hopefully still remain. Not only will Option 3 preclude a scenario whereby “all eggs are placed in one basket” (i.e. the entire bullfrog population is either protected *in situ*, or relocated somewhere else), it will also provide the greatest opportunity to learn how best to conserve Giant Bullfrog populations in the face of encroaching development.

Although the above mentioned alternatives are excellent suggestions they are not all feasible. After a discussion with Vincent Carruthers it was decided that the best option for the conservation of the Giant Bullfrogs will be to try and protect the Giant Bullfrogs on site and not to relocate them. The main reason for this is the high percentage of unsuccessful relocation of the Giant Bullfrogs. The following EMP for the conservation of the Giant Bullfrogs on site was suggested.

6.2.1 Giant Bullfrog Environmental Management Plan

The EMP is based on the following issues:

a) Socio-economic pressure.

Economic development and the provision of housing are imperative in South Africa today. The principles of NEMA require that both biodiversity and community interests must be considered.

b) GDARD standard mitigation measures for Giant Bullfrogs (abbreviated quotation):

“When the specialist is of the opinion that sufficient habitat will be conserved and/or that connectivity between the site and surrounding areas should be retained, the following is recommended:

- Site-specific habitat management.
- Commitment by developer to implementation.
- Monitoring and reporting procedures.
- Information boards and public awareness.
- Exclusion of domestic pets.
- Restricted planting of trees.
- Barriers to prevent frogs from entering unsuitable areas.
- Restricted speed of traffic.

c) Genetic connectivity.

Giant bullfrogs require very specific breeding sites, which are often separated by considerable intervening distances. Members of different breeding populations, especially juveniles, traverse between breeding sites in order to integrate with one another and sustain the genetic integrity of the species.

d) Ecosystem conservation.

Environmental science is moving away from the conservation of individual endangered species and is emphasizing the need to conserve viable ecological processes. The near-threatened Giant Bullfrog is a “flagship” representative of an important type of wetland system in the highveld. Hill-slope seepage and palustrine wetland, as found on the site, performs vital services such as flood velocity attenuation, sediment arrest, erosion control and toxicant filtration. Giant Bullfrogs and other amphibian species are closely associated with this type of wetland and the decline in those species in the region is concomitant with the expansion of development and the destruction this wetland habitat.

e) Translocation.

Translocation is seldom successful as a conservation measure. Adult Giant Bullfrogs are philopatric and translocated adults become disorientated or instinctively try to return to their original breeding grounds with high consequent mortality. Translocation of tadpoles to neighbouring localities has been advocated

“as last resort.” Harrison *et al* (CAMP 2001). However, tadpole translocation is also ineffective for the following reasons:

- Giant Bullfrogs breed prolifically and produce far more eggs and tadpoles than can ever reach maturity.
- The number that survives is determined by the ability of the surrounding environment to support them – not the number at the outset.
- If additional tadpoles are introduced into a viable breeding colony from elsewhere the survival rate will remain unaltered at the environmentally sustainable level i.e. a larger number will perish.
- Furthermore, all translocations increase the probability of transmitting disease and disrupting natural gene dispersal processes.

f) Education, awareness and research.

Threats to Giant Bullfrogs and wetland systems generally arise from ignorance more often than malice. Considerable mitigation can be achieved through education and awareness programmes and continuing research.

Based on the information above the following management plan is suggested, please refer to Appendix F for the full detailed Giant Bullfrog EMP:

1. Phase development:

Construction should be phased from north to south over a four or five year period so that the southern end of the development will remain undisturbed for at least four summer seasons after 2013/14. This will allow a programme of mitigation and conservation to be implemented and enable the Giant Bullfrog population to be gradually confined into a corridor untransformed areas.

2. Provide conservation area in layout:

The artificial dam and the wetland should be rehabilitated and conserved in order to create an adequate habitat for the Giant Bullfrogs. The wetland and artificial dam should have a 30m buffer zone.

3. Plan a wetland corridor:

As development takes place on the northern sections of the site, Giant Bullfrogs will be displaced from their foraging grounds. They must therefore be allowed to disperse along a corridor to non-urbanised areas such as Diepsloot River and Riversands Farm on the south. This corridor must be delineated and landowners approached to agree to allow the movement of bullfrogs over their land. The proposed corridor is approximately 150m wide at the site boundary, widening to 400m at Knoppieslaagte Road. Most of it lies in palustrine wetland and is unlikely to be developed in the future. These properties include Portions 97 and 100 of the Farm Diepsloot 388 JR.

4. Constrictive fencing programme.

As civil engineering and building progresses from north to south over the site, dormant bullfrogs underground will be displaced. To prevent extensive destruction of the population adult Giant Bullfrogs should be prevented from returning to these areas after breeding each season. When they congregate again at the breeding site at the start of the rainy season temporary fences must be erected to prevent re-dispersal into sections of the site where construction is to take place. The following procedure should be followed, please refer to Figure 7.

- 4.1 Shade netting 1m wide should be used. The lower edge of the shade netting should be buried at a depth of 200mm across the full width of the site before the first summer rains (September-October). A width of 750mm of netting must remain free for erection as a fence when required.
- 4.2 Steel fencing posts should be erected at 20m intervals and droppers in the ground every 3m next to the shade netting with a single top-wire strand at a height of 750mm.
- 4.3 A biologist should be employed to monitor the breeding site after the first heavy summer rains to advise when breeding takes place and bullfrog numbers at the breeding site are at a peak.
- 4.4 When most adults are at the breeding site, the free edge of the shade netting should be lifted and fastened to the top-wire along the fence. Erection of the shade netting must be completed within 48 hours of notification by the biologist.
- 4.5 The temporary fence should be left in place until the end of March and monitored and kept in good repair during this period.
- 4.6 In the first year the fence should be erected 1000m from the breeding site restricting the frogs to the area south of that line. In the following year it should be moved to 500m from the breeding site. The following year it should be moved 20m inside the edge of the buffer zone around the site.
- 4.7 In the winter of the next year a permanent impermeable fence or wall should be constructed along the buffer zone boundary, leaving the south-eastern boundary open to the wetland corridor. Refer to EMP for detailed breakdown.
- 4.8 On the western boundary the full width of the entrance to the corridor should remain unfenced to allow access. If security fencing is required it should be a paling fence with intervals of 125mm or more between pales. Additional security systems such as electrification or razor wire should not be placed lower than 750mm above the ground.

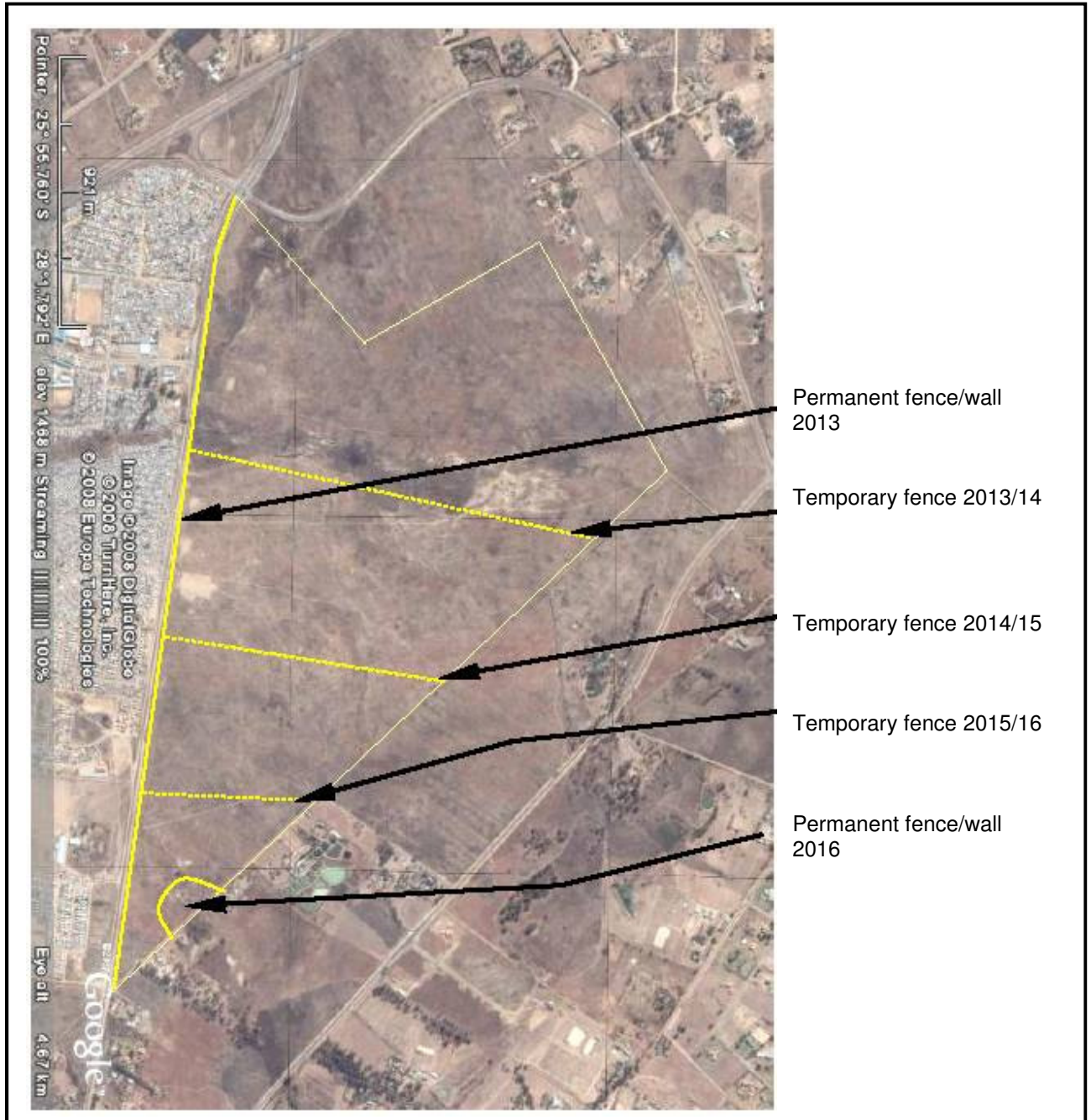


Figure 7: Permanent and temporary fencing positions as per the Giant Bullfrog Environmental Management Plan.

Note: the timeline as per the Bullfrog Management Plan will be adapted according to the date the Environmental Authorisation is issued by GDARD.

5. Fence William Nicol Drive / R511 boundary.

Road-kills, account for a large proportion of adult deaths during periods of migration and dispersal. Constricting the dispersal range (see above) will increase the probability of deaths on William Nicol Drive / R511. An impervious fence should be constructed along the full length of the western boundary of the site before the temporary restrictive fencing begins. If neighbouring landowners permit it, the fence should be

extended beyond the site itself, especially at the southern end. Fencing can take the form of a fine wire mesh or concrete wall. The former should be 20mm mesh up to a height of at least 750mm above ground and buried to a depth of 300mm. Such fences are normally incorporated into higher, robust security fences. An example may be observed on the N4 Bakwena Highway where it passes through the Onderstepoort Nature Reserve. Electrified fencing should not be placed lower than 750mm from the ground.

6. Excavation and handling bullfrogs.

As much excavation and civil engineering work as possible, should be carried out during mid-summer when adult bullfrogs are more likely to be abroad. Any bullfrogs that are found on the construction site should be carefully removed to the southern side of the temporary fence and released.

7. Storm water management.

Increases in runoff from paved areas in the development and, later, the K54 road must be carefully managed to retain the sensitive perched aquifer and hill-slope seepage wetland system.

8. Substrate management.

Rigorous standards with penalties must be written into contractors' and subcontractors' agreements to control soil erosion, pollution and earth compacting. Vehicle access into the habitat conservation zone must be kept to a minimum.

9. Contractor training.

All personnel working on the site must be trained in the following:

- awareness of Giant Bullfrogs,
- their ecological importance and legal protection,
- and how to identify, capture and move bullfrogs to the habitat conservation zone.

Personnel must attend a one-hour practical instruction session led by an experienced herpetologist. Attendance at instruction sessions should not exceed 30 people at a time. Sessions should be repeated from time to time for new recruits arriving on site. Terms of appointment for contractors and subcontractors should stipulate that they are responsible for all of their staff attending a training session.

10 Materials.

The following materials must be available on the site:

- An experienced herpetologist must prepare an instruction manual. It should be based on this EMP. Copies must be provided to all contractor and subcontractor teams on the site.

- Weatherproof information boards or posters to aid identification and handling procedure, and to remind personnel of the legal and ecological importance of bullfrogs, should be erected at all site offices and other convenient positions.
- Clean buckets and dry river sand for covering accidentally unearthed specimens must be kept especially for the purpose of holding and moving captive Giant Bullfrogs.

Each contractor and subcontractor must appoint a responsible person on the site who must be given in-depth training and must be provided with a handbook of instructions, posters and collecting equipment.

6.3 Wetland Delineation

During the Environmental Impact Assessment Phase various meetings were held with City of Joburg regarding the proposed layout and the impact of the development on the wetland. It was requested by City of Joburg that a new wetland delineation should be conducted as there were discrepancies regarding the specialists study that was already conducted and studies that were done by City of Joburg. Based on this request Wetland Consulting Services were appointed to conduct a wetland delineation study and to review the previous wetland assessment that was completed. This section is therefore based on the final wetland delineation study done by Wetland Consulting Services. Should any I&AP like to view the first wetland delineation study that was completed for the project they can request that from the environmental consultant.

According to research done by Wetland Consulting Services it was noted that the proposed wetland was previously exposed to sand mining. This resulted in a significant impact on the ecological integrity of the wetland; the expansion of the wetland area as well as the degradation of the wetland by exposure to erosion.

The wetland delineation indicated that there are two different hydro-geomorphic wetland types on site, namely:

- Channelled valley bottom wetlands; and
- Hillslope seepage wetlands

The total delineated wetland area covers approximately 88 hectares, consisting of 11 ha as valley bottom wetland and 77 ha as hillslope seepage wetland, 4 small farm dams were also identified within the valley bottom wetlands.

The main channelled valley bottom wetland on site drains from east to west across the site and then through the existing Diepsloot West Township to eventually drain into the Diepsloot River, a tributary of the Jukskei River. A second channelled valley bottom wetland, a tributary of the main channelled valley

bottom wetland, drains from north east to south west and joins the main valley bottom wetland just upstream of William Nicol Drive / R511 road crossing. The large hillslope wetland delineated on site drains into the main valley bottom wetland and forms the headwaters of this wetland. Two smaller hillslope seepage wetlands were also located further to the south of the site, one draining towards the west and the other to the south east.

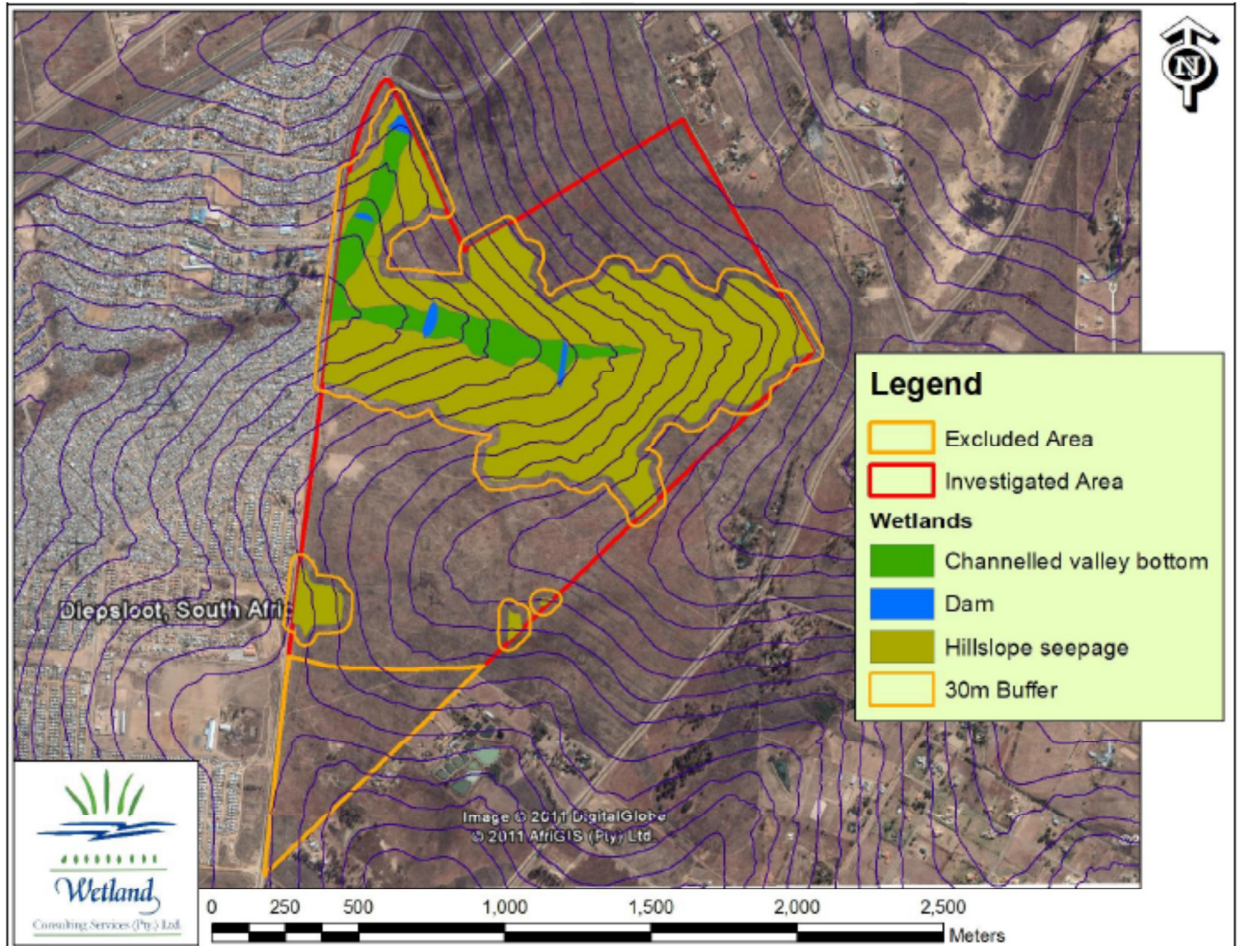


Figure 8: Wetland Delineated Areas, as provided by Wetland Consulting Services.

Note: the "Excluded area" as indicated in the map is the Giant Bullfrog Conservation Area which will be excluded from the proposed development and therefore was not included as part of the assessment.

6.3.1 Water Quality

Site S1 (Upper Wetland Reach)

According to the overall results the ecological water quality is Category C (Moderate Quality) with a reasonable amount of organic content. The diatom species assemblage for the site is characteristic of fresh to brackish, low oxygenated water with elevated supply of nutrients. There is also an indication of degradation and pollutants.

Site S2 (Lower Wetland Reach)

According to the results the overall diatom community suggest that the water quality is in relatively good condition with naturally elevated electrolytes and nutrients typical of a valley bottom system with perhaps some indication of disturbance from surrounding land-uses.

5.3.2 Functional Assessment

According to Wetland Consulting Services both wetland types have been impaired due to the disturbances that have taken place within the wetlands. The conversion of subsurface flows to surface flows in large areas of the hillslope seepage wetlands has reduced the wetlands ability to remove nitrates and trap toxicants, while also reducing the streamflow regulation capacity of the wetland. The increase in surface flow also increased the erosion risk and the export of sediments rather than the trapping of sediments.

Due to the changes in flow derived from the impacts on the hillslope wetland there has also been changes to the functionality of the valley bottom wetlands. The construction of the dams across the wetlands have resulted in concentrated flows with a high velocity which reduced the wetlands ability to enhance the water quality of the wetland, assist with flood attenuation, streamflow regulation and sediment trapping.

The wetlands play an important role in the provision of thatching grass to residents from Diepsloot West Township. The thatching grass is sold along William Nicol Drive / R511 and is therefore an important income for some of the residents of Diepsloot West Township.

5.3.3 Present Ecological State (PES) Assessment

According to Wetland Consulting Services the wetlands on site have departed significantly from the reference or natural conditions of a wetland due to the significance of the impacts on the wetlands. It can therefore be said that the PES of the wetland are largely modified.

5.3.4 Ecological Importance and Sensitivity

All wetlands are considered to be sensitive and important due to their functional value. The wetlands also represent the movement of water through landscapes which is essential and regarded as important. The functionality of the wetlands on site has been reduced and therefore most of the wetlands on site are considered to be of low / marginal ecological importance and sensitivity, with only the valley bottom wetlands considered to be of moderate importance and sensitivity.

5.3.5 Recommendations

The following recommendations were made by Wetland Consulting Services;

- It is evident from the adjacent Diepsloot West Township that high density developments result in further degradation of wetlands. It is therefore recommended that the wetland forms part of the development by providing landscaped recreational functions that can be used by the community.
- It is essential that rehabilitation be done.
- Proper management of the wetland system is essential.
- The roads that cross the wetland should be constructed over the existing dam walls.
- Provision of attenuation facilities within the wetland should be considered so as to assist with water attenuation and sediment capturing.

6.4 Heritage Impact Assessment

The Heritage Impact Assessment (HIA) was conducted by the Archaeology Contracts Unit from the University of South Africa (UNISA) and the following were found:

6.4.1 Stone Age and Iron Age Remains

No archaeological (either Stone Age or Iron Age) artefacts, features, structures or settlements were recorded during the survey.

6.4.2 Structures

A dilapidated multi-room brick structure was recorded. The structure is younger than 60 years and, therefore, not protected by the National Heritage resources Act (Act no. 25 of 1999) and as such of low significance.

6.4.3 Graves

An extensive graveyard was recorded with approximately 100 graves. Most of the graves are either unmarked or older than 60 years and are therefore protected by the NHRA (Act No. 25 of 1999). The graves must be fenced off during construction and the operational phase of the project.

Please refer to Figure 4: Environmental Sensitive Areas for the location of the graveyard.

6.5 Landscape Development Plan

A preliminary Landscape Development Plan (LDP) was compiled by NLA for the proposed development, refer to Appendix G. The following recommendations were made:

6.5.1 Landscape Development Zones

The Diepsloot East Residential Development has been proposed for development on a vacant piece of land which has a stream, hillslope seepage and valley bottom wetlands central to it. The delineated wetlands are incorporated into a central landscape conservation area. This landscape is further divided into the following zones:

- Intensive conservation zone: the area immediately surrounding the stream, the most sensitive part of the wetland system. This zone has been expanded to incorporate the 1:100 year floodline of the watercourse as an extra conservation measure. No development of any kind may take place in this zone except where authorized restoration and rehabilitation activities are undertaken. The area will not be accessible for residents and the public, except where sensitive north south circulation routes are proposed which will purely be for safe pedestrian movement across the site, as a controlled safety measure.
- Conservation zone: the area between the intensive conservation zone and the buffer zones and is made up of green (soft) recreational spaces. This area incorporates grassland vegetation of the Egoli Granite Grassland vegetation type as described by Mucina and Rutherford (2006), as well as wet zones and delineated wetlands. No development of any kind may take place in this zone except where authorized restoration and rehabilitation activities are undertaken. The area will not be accessible for residents and the public except where sensitive north south circulation routes are proposed, purely for safe pedestrian movement across the site, as a controlled safety measure.
- Low intensity recreation zone: the area between the conservation area and the high intensity recreation zone. This zone will consist only of indigenous vegetation and does not allow for any activities other than a pathway which runs along the northern and southern edges of the site in an east – west direction. Residents of the Diepsloot East Residential Development will be able to use this pathway as a walkway which allows them to reconnect with nature as they walk alongside indigenous vegetation, the pathway allows views into the conservation zones as well. Seating may be placed at selected intervals along this path – to allow residents to pause and enjoy the nature surrounding them.
- High intensity recreation zone: the area between the low intensity recreation zone and the road. This zone is made up of the pavement and the linear community parks along the boundaries of the conservation areas. The high intensity recreation zone proposes lawned activity spaces, minimal hard activity spaces and children's play equipment. This zone allows residents to utilize their open spaces and reconnect with nature – creating a significant link to the natural environment which supports and encourages the conservation initiatives. Indigenous trees will provide shade for gathering spaces, outside of the sensitive areas.

6.5.2 Conservation and Habitats

As mentioned above the landscape development plan aims to conserve the maximum natural vegetation, fauna and avi-fauna habitats.

- The conservation and intensive conservation zones will undergo no development except where authorized restoration and rehabilitation activities are undertaken.
- The zones may only be traversed by a maximum of four pathways, these pathways will allow for safe and sensitive crossing of the wetland areas;
- Pathways must be placed in such a way as to prevent any other informal crossings of the site i.e. accessibility, ease of use and safety measures must be considered.
- Maintenance and conservation practices must be in line with the Environmental Management Plan (EMP) prepared for the site.
- Any vegetation used in authorized restoration and rehabilitation activities must be indigenous and in line with the species found in the Egoli Granite Grassland vegetation type.
- No indigenous vegetation may be removed from the conservation zone, except where such removal is in line with the EMP.
- No fauna or avi-fauna species may be removed from site.
- Fire breaks or acceptable fire management system must be implemented according to the EMP.

6.5.3 Vegetation

Vegetation is key to both the development and the conservation zones. Street trees and other indigenous landscaping will provide a healthier, more attractive living environment, while the conservation zone is proposed primarily to conserve the natural vegetation which occurs on site.

Street trees

- All street trees used in the Diepsloot East Residential Development must be indigenous to South Africa and specifically to the region. An indicative list of trees has been compiled for use in the Diepsloot East Residential Development, any additional trees must be indigenous to the area and must be authorized by the Environmental Control Officer (ECO) or a Professional Landscape Architect before being used in the project.
- In order to provide a beautiful and varied landscape, the street trees mentioned below must not be used in continuous lines but must be varied from street to street or within the residential blocks. A variety of trees must be used for biodiversity, habitat and aesthetic reasons. The landscape development plan proposes different trees along different streets to provide some uniformity in landscape character of each street.

- Street trees are placed at a minimum of 10m intervals on the LDP however certain tree species may have alternative space requirements. Budget and availability of species may also affect street tree intervals.

Table 6: Street Trees as suggested by the Landscape Development Plan

<u>Street trees</u>
Dombeya rotundifolia
Celtis africana
Berchemia zeyheri
Rhus lancea
<u>Conservation area</u>
Vangueria infausta
Rhus pyroides aka searsia pyroides
Ehretia rigida

Grouped planting

- Trees used in general landscaping should be in keeping with the list provided above or the Egoli Granite Grassland species list.
- Planting layouts in the park areas should be as natural as possible and should not be too dense, to remain in keeping with the grassland vegetation of the area. Trees should be kept within the recreation zones except for a few scattered shrubs in the conservation area.

Lawn and groundcovers

- Lawned areas must be kept to a minimum in the recreation zones.
- The recreation buffer zone boundaries are at a maximum of 30m from the road, except where community parks have been developed outside of the wetland delineation zone. Lawn only covers some of these linear buffer zones – between the pathway and the pavement.
- Community park areas will / may have more lawn to allow for recreational activities to take place, however this lawn must also be kept within the boundary of the pathway indicated on the LDP.

- The area between the pathway and the conservation zone must be planted with indigenous veld grasses and herbaceous species of the Egoli Granite Grassland species list – this area must be maintained and can have more of a “garden feel” than the conservation zone with the possible use of rockeries and focal plants, however species habitats and appropriateness of species must be considered.
- Lawn used in the recreational areas must be *Cynodon dactylon* or an acceptable indigenous variety of this species.

Conservation zone

- No additional planting should take place in the conservation area except where locally indigenous species are re-introduced as part of a restoration and rehabilitation plan to improve the ecological and biodiversity status of the conservation area.

Intensive conservation zone

- No additional planting should take place in the conservation area except where locally indigenous species are re-introduced as part of a restoration and rehabilitation plan to improve the ecological and biodiversity status of the conservation area.
- Wetland species used in the intensive conservation zone must also be in keeping with a restoration and rehabilitation plan.

6.5.4 Entry and exit points

Although the linear parks along the boundary of the conservation area can be accessed from any point along the pavement, hard surfaces and more pronounced entry and exit nodes are proposed as part of the community park system, at the terminus of local roads within the development.

- Entry and exit nodes must double up as gathering spaces within the landscape
- Entry and exit nodes provide access to the pedestrian pathways traversing the conservation zones.
- Signage must be provided at the entry and exit points of the site to alert users to the guidelines for using the park.
- Lighting and dustbins must be provided at the entry and exit nodes of the park.
- Parking for motor vehicles will be provided in the streets, no additional parking may take place within the boundary of the conservation and park area.

6.5.5 Pedestrian and bicycle circulation

- The pavements provided for and described in the Urban Development Framework allow for adequate pedestrian movement along the boundaries of the conservation areas.
- An additional, more relaxing pathway is proposed as the boundary between the high and low intensity recreation zones, although this path is not a compulsory development, any access within this zone may have the maximum impact that this pathway would have, but no more.
- Materials used for the pathway must have a low ecological footprint and must come from a sustainable source.
- Pathways must be designed and implemented in such a way to prevent erosion and other degradation – the design of the pathway must limit informal movement across the site – an optimal layout must be designed according to the final UDF.
- As a form of high intensity recreation bicycles will be acceptable in the recreational zones of the park, but only along assigned pathways. Pathways that allow for bicycle access must be wide enough and the bicycle route must be marked as such.

6.5.6 Vehicle control

- Bollards will be implemented between the pavement and the high intensity recreation zone to prevent vehicle access to the park.
- No vehicles will be allowed into the park except where maintenance and conservation practices require it, and where authorized in the EMP.

6.5.7 Hardscaped areas

A variety of hard surfaces have been proposed in the LDP, however these may not exceed the hard surfaces indicated on the Landscape development plan.

Community spaces

As part of the community parks and activity nodes indicated on the Schematic Landscape Development Plan hard surfaces have been proposed, these nodes should:

- Not exceed the areas indicated on the Landscape development plan, and should only be designed to the necessary size – no larger.
- Be made up of sustainable materials with a low ecological footprint.
- Should be permeable where possible to allow for groundwater recharge.
- Allow for the planting of trees to create shaded, useful spaces

Pathways

- See 1.5 Pedestrian and bicycle circulation above, further to this;

- Pathways should formalize desire lines i.e. should occur where people are most likely to walk between facilities
- Pathways of different movement hierarchies should be designed out of different materials – pathways that will carry heavy foot traffic should be made of a durable material, whereas pathways that will be used less often may be made of a material that is still durable but that is more natural looking – so as to blend in with natural feel of the landscape.
- Pathways that traverse the conservation zones must be designed as a boardwalk so as to create as little impact on the flora and underlying soils as possible. Materials used in the construction of such a pathway must be made of sustainable, durable materials, if timber is used it must come from an FSC (Forestry Stewardship Council) acceptable plantation.
- Signage and dustbins must be situated at entry points to the conservation zones, along pathways to discourage litter pollution and informal movement through the conservation areas.
- Wherever possible pathways should be designed as a route that incorporates already degraded / disturbed areas so as to not disturb the landscape unnecessarily.

6.5.8 Play areas

- Play areas have been indicated on the landscape development plan in conjunction with community nodes, at the terminus of local roads within the development.
- Play areas should occur in areas where passive surveillance is possible at all times
- Play areas should minimize hard surfaces – but should not create areas where landscaped degradation can take place.

6.5.9 Picnic areas

- Although formal picnic areas might not be included in the final landscape design – where there are shaded areas that might be used by residents of the Diepsloot East Residential Development as such – dustbins must be provided.
- If picnic areas are formalized all furniture and surfaces must occur within the high intensity recreation zone, where they are visible.
- Materials used in the construction of formal picnic areas should be durable, sustainable and have a low ecological footprint.
- No braai facilities may be designed in the recreation areas as these will cause fire hazards to the conservation zones.

6.5.10 Activities (Activity zones)

- Formal sports facilities have been provided for in the Urban Development Framework, as such it will not be necessary to design formalized sports facilities as part of the recreational zones of the park.
- Activities envisioned for the linear recreational zones are predominantly passive – including walks, seating with views into the conservation areas and shaded areas where picnicking and low intensity sports might take place – with play areas and community nodes at selected intervals – the character of these spaces must be maintained by the landscape design in the eventual landscape character.

6.5.11 Giant Bullfrog Conservation Area

- Please refer to the specialist report for specific guidelines on the development of a Giant Bullfrog friendly habitat
- In the landscape development plan pathways and an information node were proposed;
 - The pathways allow for movement of people through the site while preventing informal movement across the bullfrog habitat – these pathways should be a boardwalk system that minimizes the impact on the fauna and flora.
 - The information node allows for environmental educational facilities within the development – this node does not have to take the form of an environmental centre but should rather be as sensitive to the environment as possible – a simple shaded seating area for talks and information boards should be considered as an alternative.
 - Hard surfaces in the Bullfrog area must be limited to the northern edge where it can be accessed easily by visitors.
 - If access and movement in the areas needs to be restricted it is advised that only one entry point to the area be allowed which can be monitored and can be used to limit or restrict access when necessary.

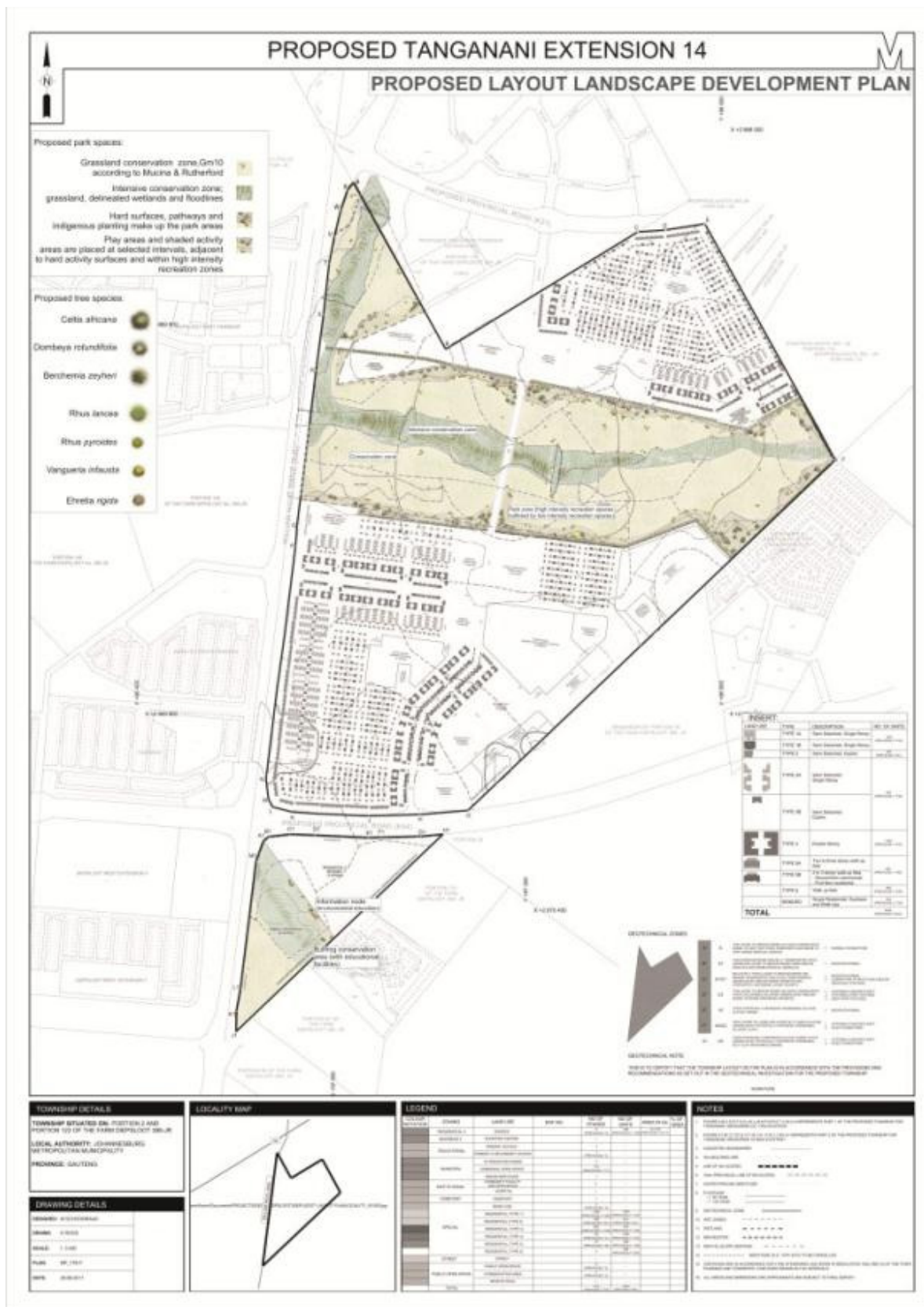


Figure 9: Preliminary Landscape Development Plan

7. METHODOLOGY FOR ASSESSING THE ENVIRONMENTAL IMPACTS

The overall aim of an ecologically sound development project is to minimize the negative impacts of the project on the environment, thus limiting the ecological footprint of the project while moving towards greater sustainability over the longer term. Using an Assessment Criteria for the Environmental Impacts as well as conducting Specialist Studies will assess the environmental impacts.

7.1 Assessment Criteria for the Environmental Impacts

7.1.1 Cumulative Effects

It is important to assess the natural environment, using a systems approach that will consider the cumulative impact of various actions. Cumulative impact refers to the impact on the environment, which results from the incremental impact of the actions when added to other past, present and reasonably foreseeable future actions regardless of what agencies or persons undertake such actions. Cumulative impacts can result from individually minor but collectively significant actions or activities taking place over a period of time. Cumulative effects can take place so frequently in time that the effects cannot be assimilated by the environment.

An assessment of the impact that the proposed development may have on the environment includes evaluating the impact according to a series of assessment criteria. This will be undertaken by considering the effects that may result should the impact occur.

7.1.2 Impact Assessment

As a means of determining the significance of the various impacts that can or may be associated with the proposed project, a series of assessment criteria will be used for each impact. These criteria include an examination of the extent, duration, probability of the impact occurring, significance & magnitude status of impact and scale of confidence level.

Table 7: Environmental Impact Assessment Criteria.

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
Nature of impact: <i>This is an appraisal/evaluation of the type of effect the construction, operation and</i>	Positive	Benefit to the environment	+ 've'
	Negative	Detriment to the environment	- 've'

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
<i>maintenance of a development would have on the affected environment.</i>			
Extent of the impact	Site specific	Extending only as far as the activity, or Limited to the site and its immediate surroundings	1
	Local	Effect felt within 5km from site boundary	2
	Regional	Effect felt within 20km from site boundary A development can often have a regional impact on Biodiversity. If a feeding site for birds or mammals is destroyed, the population might leave the area or go extinct if they don't find other suitable areas. The same applies for national and international if one considers the cumulative impacts. Studies have shown that housing developments can lead to losses of up to 90% of the species in an area where as stock farming on natural veld ensures that up to 80% of the species remain.	3
	Provincial	Will have an impact on a provincial scale	4
	National	Will have an impact on a national scale - particularly if an ecosystem or species of national significance is affected	5

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
	International	Will have an impact across international borders or will impact on an ecosystem or species of international significance	6
Duration of impact	Immediate	Less than 1 year	1
	Short term	(1-5 years)	2
	Medium term	(5-15 years)	3
	Long term	(16-30 years) Impact will cease after the operational or working life of the activity, either due to natural process or by human intervention	4
	Permanent	Impact will be where mitigation or moderation by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient or temporary	5
Intensity: Negative	Minor	The environment is not really affected	0
	Low Impact	The environment is only marginally affected and mitigation measures are easy, cheap and quick	1
	Medium	The environment is only moderately affected and impacts are fairly easy to mitigate	2

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
	High	The environment is only marginally affected and mitigation measures are very difficult, time consuming and expensive	3
	Very High	The environment is permanently affected and the impacts are irreversible and cannot be mitigated	4
Positive	Minor	The environment is not really affected	0
	Low	Minor improvements	1
	Medium	Moderate improvements	2
	High	Large improvements	3
	Very High	Permanent improvements	4
Probability of occurrence	Improbable	Low Likelihood - Less than 40%	0
	Possible	Distinct possibility – 40%-70% sure of a particular fact or of the likelihood of that impact occurring.	1
	Probable	Most likely - 70%-90% sure of a particular fact or of the likelihood of that impact occurring.	2
	Definite	More than 90% sure that the impact will occur	3

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
Determination of significance <i>Based on a synthesis or combination of the information contained in the above-described procedure; and drawing on standards, targets for Biodiversity conservation, known thresholds for ecosystem services, species or ecosystem viability, and/or carrying capacity of ecosystems; the specialist is required to assess the potential impacts in terms of the following significance criteria:</i> Significance = (Intensity + Duration + Extent) x Probability	Very Low	The impacts do not influence the proposed development and/or environment in any way	0-4
	Low	The impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation (a choice of other methods to alleviate the impacts)	5-12
	Moderate	The impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated (lessened or improved) by a modification in the project design or implementation of effective mitigation measures. Should have an influence on decision, unless it is mitigated	13-25
	High	The impacts will have a major influence on the proposed development and/or environment. The impacts could have the no-go implication on portions of the development regardless of any mitigation measures that could be implemented. Mitigation is possible but it is expensive and time consuming	26-44
	Very High	The impacts will have a permanent influence on the proposed development and/or environment. The impacts cannot be mitigated	45
Risk or likelihood of irreversible or irreplaceable loss of natural capital	It should state clearly whether or not the impacts may be irreversible, or may result in an irreplaceable loss of Biodiversity. The levels of uncertainty associated with making predictions of impacts should also be stated.		
Confidence	The specialist should state what degree of confidence there is in the predictions		

CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT.			
CRITERIA	CATEGORY	DESCRIPTION	RATING
		based on the available information and level of knowledge and expertise. Low Medium High	
Effects on valued ecosystem services		It should be stated clearly whether or not the impacts could result in either a degradation or deterioration of ecosystem services, and the associated implications to affected communities or society as a whole should be explained	
Legal Requirements		Identify and list the relevant South African legislation and permit requirements relevant to the development proposals. Describe whether the development proposals contravene or oppose the applicable legislation	

8. ALTERNATIVES

In terms of both the National Environmental Impact Assessment (EIA) Regulations (GNR385, 21 April 2006) and the National Environmental Management Act (Act No. 107 of 1998), the applicant is required to demonstrate that alternatives have been discussed in detail. Please be advised that during the Environmental Impact Assessment Phase the project was allocated to the Gauteng Department of Human Settlement and due to this some of the Alternatives mentioned in the Scoping Report are not relative. For this reason the Alternatives were reconsidered and the following Alternatives were given:

- The 'No Go' or no development alternative
- Energy alternatives
- Development layout.

The Impact Assessment for each of the alternatives can be viewed as Appendix H.

8.1 "NO GO" Alternative

The 'No Go' alternative will mean that the site will stay exactly as it is and no development will take place.

As also mentioned in the Scoping Report, the proposed site is currently vacant and has been exposed to human activities for some time already. It is as a result of these human activities that the site is severely disturbed. It should be clear that if the current situation continues the area will become even more degraded over time.

The proposed site is located next to the existing Diepsloot West Township where the great demand for housing in the area renders the site ideal for the development of housing. If the proposed site was to stay undeveloped the chance exists that the site will be invaded by illegal settlers. It should also be considered that, as there are no facilities or infrastructure on the site, such invasion will directly contradict the Gauteng Department of Human Settlement's initiative to eradicate informal settlements. The illegal invasion of the property will further have severe consequences for the environment and might be a nuisance to adjacent land owners.

Please be advised that no mitigation measures will be included in the "no-go" option as nothing will happen on site and everything will thus proceed as it is.

8.2 Energy Alternatives

The following energy alternatives will be encouraged when the different housing units are built:

- Solar geysers
- Photovoltaic cells
- Gas stoves
- Gas push through geysers
- Insulation

8.3 Development Layout and Densities

As previously mentioned there have been a lot of changes to the original layout of the development due to the following:

- 8.4.1 Public Open Space
- 8.4.2 Giant Bullfrog Management Plan
- 8.4.3 Road Network

8.3.1 Public Open Space

In the northern section of the site the layout plan had to change to accommodate the wetland as well as the 1:100 year flood line. It was decided that the best option is to include the wetland in a park with the purpose of "Conservation and Protection" of the wetland, as suggested by the City of Joburg. There were three alternatives for the park:

- The first option was to establish a more active park with children playgrounds, sport fields, horse trails and even to create a Township TV Park. After receiving the wetland delineation report and the comments from the City of Joburg it was however decided that the wetland is a very sensitive area and should rather be used for conservation and protection purposes. If an Active Park is approved there will be the possibility that the wetland could be under threat. The activities could be too close to the wetland and could even invade the wetland area. It should be kept in mind that although the wetland / park will be rehabilitated and this will have a positive impact, the specific activities of an active park could have negative results.
- The second option was to use Mark Tyrrell's Urban Design concept for Diepsloot West Township and create a social and ecological spine / corridor between Diepsloot West Township and the proposed Diepsloot East Residential Development (Mark Tyrrell, 2008). This social and ecological spine / corridor will form a large public space which will include wetland, sports and community areas. It will also open up the opportunity to demarcate land areas for public buildings. By creating this spine / corridor the two townships will be linked instead of being separated into two islands. Although this option could have a positive impact on the social infrastructure of the proposed development it might have a very negative impact on the ecological / environmental value of the

wetland. As with the active park this type of development along the wetland might just lead to wetland intrusion and destruction, the introduction of weeds and exotic plant species and the destruction of fauna & flora habitat. The wetland will have to be fenced off which will defile the purpose of this social/ ecological park or spine. With further investigation and from the comments received by the specialist and the City of Joburg it was decided not to go with this option.

- The third option is to zone the wetland area as a Conservation and Wetland Protection Area. This will mean that the wetland will have to be rehabilitated to a state where the wetland will be ecologically functional and the area zoned as Conservation & Wetland Protected Area will have to be fenced off from any other development activities. By rehabilitating and protecting this area there is a possibility that natural bird and animal life will return to the Diepsloot area. The problem however is that the fence will get stolen and people will encroach into this area.

In the first two options mentioned above the wetland might be at risk as there is a possibility that the proposed activities might move closer to the wetland and start to creep into the more sensitive wetland areas and in this way destroy the wetland. If the human activities are kept to a minimum the chances of this happening will be minimal. By having humans and animals move through the wetland zones there will be a bigger possibility of exotic vegetation and weeds to establish in the wetland areas. Other problems with the above mentioned options are that there is not enough space available for the wetland and additional park area for human activities such as sport facilities and playgrounds. The wetland already covers a large portion of the proposed development area and together with the artificial wetland and dam on the southern section of the site, it will result in less space for residential development.

For the above mentioned reasons it was decided that the majority of the wetland area will be a Conservation and Wetland Protection Area but that a strip along the wetland buffer zone will be used as a park. This strip will be located along the northern and the southern boundary of the wetland. The strip will allow for:

- the movement of people along the busy access road along the northern boundary;
- small playgrounds where kids could play;
- seating areas
- picnic areas
- proper storm water management

8.3.2 Giant Bullfrog Management

The Giant Bullfrogs are located in the southern corner of the proposed site. Two specialists were appointed and the following alternatives were suggested.

- The first alternative was to relocate the Giant Bullfrogs to a more suitable location where the frogs would not be threatened by the proposed development or by residents from Diepsloot West Township. This alternative is however not feasible as translocation of the Giant Bullfrogs are seldom successful as a conservation measure.
- The second alternative, which is the preferred option, is to conserve the Giant Bullfrogs on the site and to include the area as part of a park with the purpose of "Conservation and Protection" and to build an environmental educational centre. For this study to be feasible it will mean that a conservation corridor needs to be created between the proposed site and the adjacent sites on the south-eastern boundary in order to allow the Giant Bullfrogs to move. It is also important that this area be rehabilitated and maintained. An important factor will be the environmental educational training and the environmental awareness posters / signs on site.

8.3.3 Road Network

As previously mentioned there is a road that crosses over the wetland in order to connect the northern side of the site with the rest of the development. This road forms an important link between the residential areas and there were three options for the location of the road:

- Option 1 was to have no access across the wetland. This is however a problem as the road is seen as an essential link to allow the future residents of the northern area fast and easy access to the south and *vice versa* to allow the southern residents access to the proposed north. It should also be kept in mind that some of the people staying in the proposed development will have to walk in order to get to and from working place. If there is no easy access across the wetland they might create a pathway across and in such a way disturb the wetland. It could also become dangerous if people cross during the rainy seasons.
- Option 2 was to have two road crossings. The one crossing will go over the middle of the wetland and the other crossing will be more to the eastern side of the wetland.
- Option 3 is to minimize the roads that cross over the wetland and to have only one road crossing. This road crossing will be located on the same spot the existing dam wall is located. It was agreed with City of Joburg, as well as suggested by the wetland specialist, that this road crossing will have the least impact on the wetland. The existing dam wall is one of the reasons the wetland is in a degraded state and by removing the dam wall and replacing it with the bridge better water flow will be allowed which will be an improvement on the wetland conditions. This was seen as the preferred alternative.

8.4 Conclusion

To conclude it was decided that from an environmental point of view the following alternatives will be considered for the proposed development:

Public Open Space:

The wetland area will be a conservation area with a strip along the buffer zone that will be used as a park area. The conservation area will be fenced off from public access and a transition zone will be allowed for between the park and the conservation area.

Giant Bullfrogs:

The specialist studies indicated that the best option will be to protect and conserve the Giant Bullfrogs on the proposed site. The Giant Bullfrog area will therefore form a Conservation area with an educational centre.

Roads Network:

Only one road will cross the wetland. The position of the road will be on the same spot as the existing dam wall.

9. DESCRIPTION OF THE IDENTIFIED ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

9.1 Biological Impacts

9.1.1 Impact on floral abundance and diversity

Frequent burning followed by heavy rains severely disturbed the *Hyparrhenia hirta* grassland by causing surface and spatter erosion. The Egoli Granite Grassland was considered not to be sensitive to disruption. Footpaths bisect the terrain, considerable quantities of rubbish have been dumped and the lower part of the valley is being used as an open-air toilet and is badly fouled (Galago Environmental, 2007).

The only orange data plant that was found on site is the *Hypoxis hemerocallidea* (African potato). According to Galago Environmental (2007) the African potato plants should be relocated to a suitable conservation area such as the GDARD conservation area as a medicinal plant. It is suggested that an ecologist or a Landscape Architect be appointed to relocate these plants. If the plants can't be removed before construction starts they should be fenced off in order to protect it from construction activities.

The vegetation along the drainage line is disturbed by severe surface erosion and the presence of many *Seriphium plumosum* plants, which in some areas dominated the vegetation community. The species diversity of this vegetation community is low with only a total of 55 indigenous plant species recorded.

The wetland / drainage line is connected to the grassland on the site and with the drainage line south of William Nicol Drive/ R511 in Diepsloot West Township. Because drainage lines form corridors for the translocation of species, which include pollinators of plant species. The eroded drainage line vegetation was considered to be sensitive.

Most of the disturbed grassland areas will be used for development. The wetland / drainage line will be rehabilitated and used as a conservation and protected area within the development.

Construction:

During the construction phase the vegetation cover will be cleared to enable the building of houses, roads and installation of services. These activities will have a significant impact on the natural vegetation of the area as approximately 60% of the vegetation will be removed and animal habitats will be lost. This will result in the loss of both flora and fauna species on site. If the African potato is not relocated or fenced off, these plants will be lost. The removal of the vegetation will result in erosion and siltation. Fires during the construction phase can result in the destruction of the watercourse vegetation.

Invasion of weeds and alien invasive plant species will have a negative impact on the flora of the watercourse areas.

During the construction of the road / bridge there will be damage to the vegetation in the watercourse as some of the vegetation will be removed while other vegetation might be damaged.

Operational:

There will be no further loss of vegetation during the operational phase. Instead, it will be recommended that indigenous plants must be planted to enhance the aesthetic beauty of the landscape. Indigenous vegetation will also be planted in and around the wetland during the rehabilitation of this conservation area. It is anticipated that typical indigenous wetland plants will increase the bird and animal biodiversity of the area.

During the operational phase there is the risk of distribution of garden plants into the watercourse and Giant Bullfrog habitat areas. This can either be done by illegal dumping or the spreading of seeds by wind and birds. Other impacts will be from uncontrolled runoff, burning, littering or footpaths through the areas.

The residents from Diepsloot West Township is currently cutting the grass and selling it as thatching grass this will have a negative impact on the remaining vegetation if not stopped.

Table 8: Flora Impact Assessment.

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Probability	Definite	Definite
Intensity	High	High
Significance without Mitigation	Medium	Medium
Status	Negative	Negative and Positive
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	High	High
Degree to which the impact can be mitigated	High	High

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. Only areas that will be developed must be cleared of vegetation.
- ii. The clearance of vegetation must take place in phases so as to mitigate soil erosion and dust.
- iii. Before removing the vegetation it is recommended that the people that are selling grass for an income must clear as much grass as they can.
- iv. All existing trees, which are not invasive exotic species, and are worth saving, should be retained as far as possible.
- v. Indigenous tree species that will survive the dry and often cold winters should be planted as part of landscape development. This should specifically be kept in mind when designing the street layouts as this specific development will have a higher volume of pedestrian traffic than vehicle traffic. It is thus recommended that trees be incorporated into the landscape plans for the streets / pavements.
- vi. Trees should be planted at a minimum spacing of 6m but can be placed further apart up to distances of 10m.
- vii. When trees are planted, entrances to residential stands and other properties must be taken into account, and spacing of trees adjusted accordingly.
- viii. It is also recommended that trees be planted in the parks to insure that there is enough shade during sunny days.
- ix. The sites earmarked for conservation areas should not be cleared of vegetation, but alien vegetation must be removed and the sites must be rehabilitated with indigenous vegetation.
- x. These sites, earmarked for conservation areas should be fenced off prior to construction to insure that no vehicles or humans have access to these areas.
- xi. The African potato must be relocated before construction and vegetation clearance starts.
- xii. If the African potato can't be moved before construction it should be fenced, in order to prevent harm from construction activities.
- xiii. During operational phase residents should be encouraged to plant their own aesthetic gardens and trees on their individual stands. Only indigenous vegetation must be used.
- xiv. The period between vegetation clearing and construction of the infrastructure must be kept to a minimum.
- xv. Manage listed invasive alien plants.
- xvi. Rehabilitation of service lines.
- xvii. Landscape Development Plan must be implemented.
- xviii. No fires allowed on site.
- xix. No burning of vegetation on site.
- xx. The runoff must be managed during the construction and the operational phases in order to avoid destruction of the vegetation.

9.1.2 Impact on the fauna abundance and diversity.

Mammals:

Given due care during the construction phase, no mammal species is anticipated to be displaced. At the conclusion of the development, mammal diversity will be stabilized (such as along the planned permanent wetlands), and expanded as result of reintroductions.

Birds:

The development should not have a negative effect on the any Red Data bird species recorded for the 2228 CC q.d.g.c. The largest areas on site is highly disturbed and surrounded by development, which results in disturbance to birds. There is also a lack of sufficient breeding and foraging habitat for any of the mentioned Red Data bird species.

Reptiles and Amphibians:

As previously mentioned there are Giant Bullfrogs on site. Vincent Caruthers developed a Giant Bullfrog Management Plan for this specific site to insure that the Giant Bullfrogs will not get harmed during the construction period.

Construction phase:

During the construction period the vegetation will be cleared which means that some animal species will lose their habitat and will have to find other homes. Trapping and hunting of fauna species by construction workers could have a negative impact on the fauna. Other impacts on the fauna will include:

- Fires on site
- Dumping of waste within the sensitive areas
- Construction vehicles moving through the sensitive areas
- Dumping of construction material within the sensitive areas.

The construction period will also have a negative impact on the Giant Bullfrogs if the management plan is not followed correctly.

Operational phase:

During the operational phase the proposed wetland area as well as the Giant Bullfrog habitat will be rehabilitated by planting indigenous vegetation. By introducing the indigenous vegetation it is anticipated that there will be an increase in habitat which will lead to an increase in both animal and bird life.

Negative impacts could however result from:

- Illegal dumping within the sensitive environments.
- Fires

- Introduction of pets, especially cats and dogs, but also animals such as goats, sheep and chickens.

Table 9: Fauna Impact Assessment

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Probability	Definite	Definite
Intensity	Medium	Medium
Significance without Mitigation	Medium	Medium
Status	Negative	Negative and Positive
Confidence	Total	Total
Degree to which the impact can be reversed	Medium	High
Degree of irreplaceable loss of resources	Medium	Low
Degree to which the impact can be mitigated	High	High

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. All the environmental sensitive areas must be fenced off before construction starts.
- ii. The use of indigenous plants adapted to the region, should be encouraged for gardening and landscaping purposes. This should enhance biodiversity, particularly of birds.
- iii. The integrity of remaining wildlife should be upheld, and no trapping or hunting by construction personnel should be allowed. Caught animals should be relocated to the conservation areas in the vicinity.
- iv. The EMP for the Giant Bullfrogs should be followed at all times.
- v. Strict measures should be taken to insure that contract workers know how to handle Giant Bullfrogs or who to contact if a Giant Bullfrog is spotted during the construction period.
- vi. During the construction phase noise should be kept to a minimum to reduce the impact of the development on the fauna and the development should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity.

- vii. Where possible, work should be restricted to one area at a time. This will give the smaller birds, mammals, amphibians and reptiles a chance to move from the disturbance to an undisturbed zone close to their natural territories.
- viii. It is recommended that an Environmental Educational Centre be established in order to teach kids about the environment and especially about the Giant Bullfrogs that occur in the area. By making people aware of their environment and especially the red data species in their environment will serve as a mitigation measure to conserve and protect important areas.
- ix. No fires on site.
- x. No trapping / hunting of any animals on site.
- xi. No dumping within the sensitive environments – including waste and construction material.
- xii. Public awareness is essential in order to protect the environment. Signs must be erected throughout the development to educate people on the environmental sensitivities within the development.

9.2 PHYSICAL IMPACTS

9.2.1 Surface water:

As mentioned previously a stream and associated wetland area runs through the proposed site from east to west. The wetland is degraded due to the negative impact of human activities. A smaller stream that runs along the western boundary of the site connects with the wetland system. There is also a small artificial dam and wetland on the southern section of the site which forms the Giant Bullfrog Habitat. Except for the normal construction activities that will take place on site it is also proposed that a road / bridge be built across the wetland in order to connect the northern section of the development with the south. The construction of the bridge will have a negative impact on the watercourse but during the operational phase the bridge will however benefit the watercourse as it will allow water to flow through the system whereas it is currently damming up due to the dam walls that was built in the past.

The stream and associated wetland is degraded and polluted due to the current human activities taking place on site. These activities include illegal dumping of waste, footpaths and even roads going through the wetland area, runoff from the local roads, construction activities, burning and washing within the stream. Refer to the photos below.



Photograph 6: Illegal dumping taking place within the wetland area



Photograph 7: Construction activities that took place within the wetland area.



Photograph 8: Polluted stream water and evidence of burning



Photograph 9: Wetland being polluted by dumping of vegetation



Photograph 10: People making fire next to the road which results in the watercourse burning

Construction:

The impact of the development on surface water during construction could be minimal with the correct mitigation measures. The following activities will have an impact on the surface water:

- The washing and cleaning of any chemical compounds such as paint, petrol, oil and other chemicals within the watercourse.
- Spillages (fuel, oil, chemicals) that are not cleaned immediately could wash off into the watercourse.
- Mixing or spilling of cement while working within the watercourse or close to the watercourse.
- Poor management of storm water runoff.

- Siltation and erosion of the watercourse areas.
- If ablution facilities are not secured properly it could fall over and result in spillage.
- Washing up (bathing, hand washing, washing of dishes / containers as well as the washing of clothes) within the watercourse.
- Washing of vehicles / machinery.
- Maintenance or fixing of vehicles / machinery.
- Littering (both general waste and construction waste such as cement bags) will pollute the watercourse.
- Construction activities within the watercourse will result in the impeding of the water which could result in flooding if not managed correctly.
- The stream will also have to be redirected to allow for the construction of the bridge. If this is not done correctly it could result in erosion and even flooding of the area.
- Invasion of weeds and alien invasive plant species.

Operational:

The operational phase of the proposed development could have a great impact on surface water (wetland, waterway and the artificial dam and wetland) due to the increase of runoff water. With effective mitigation measures the impact of the runoff water could be minimized. There is also a concern that the runoff water is polluted and will pollute the water in the wetland system. Litter is also a big concern.

It is very important to control and mitigate the storm water / runoff to ensure that soil don't wash away and to prevent flooding and destruction of both the wetlands and the artificial dam. It is suggested that attenuation ponds be used to accommodate the increase in storm water / runoff in order to prevent damage to the waterway and wetland.

There is also a possibility that weeds and alien invasive species can invade the watercourse areas during the operational phase of the project. This is mainly due to gardening done by residents or residents dumping their garden waste within the watercourse areas.

Table 10: Impact assessment on Surface Water

Phase of development	Construction Phase	Operational Phase
Extent	Local	Regional
Duration	Short term	Long term
Probability	Definite	Definite
Intensity	Medium	Medium
Significance	Medium	Medium
Status	Negative	Negative

Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	High	High
Degree to which the impact can be mitigated	High	Medium

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. The wetland conservation area as well as the waterway and Giant Bullfrog habitat should be fenced off prior to any construction activity.
- ii. Washing of tools, paintbrushes and empty tins in the wetland must be prohibited.
- iii. Spills (cement, oil, fuel) must be cleaned as soon as possible and in a proper manner.
- iv. No mixing of cement on soil surfaces. Drip trays and plastic must be provided. If wheelbarrows are used it must be parked on plastic to avoid any spillages on soil.
- v. Washing of vehicles must take place in a designated area that has a proper drainage system and storm water management. Water from this area must be contained and removed as part of the construction rubble or must be recycled.
- vi. Maintenance or fixing of vehicles must take place on impervious surfaces or on a drip tray.
- vii. Ablution facilities must be properly secured and located far away from the environmental sensitive areas.
- viii. Proper facilities must be provided for washing up so as to avoid contamination of the soil and the ground water. Water from this area cannot be drained into the natural watercourse and must be contained or drained into the municipal structures.
- ix. Construction waste and rubbish bins must be collected and dumped at a registered landfill site.
- x. During construction phase Storm Water Management procedures must be in place and enforced.
- xi. Storm water / runoff should not be directed away from the site.
- xii. Storm water outlets should be placed outside the buffer zone of the wetland and adequate measures should be taken to insure that the speed of the water decrease before it reach the wetland area. It is recommended that a swale system be implemented.
- xiii. The waterway can also be used for the storm water outlet but sufficient erosion control measures and speed reducing measures should be implemented to minimize the impact of the water.
- xiv. The walls of the artificial dam should be inspected and constructed in such a way that the dam will be able to hold the water and to insure that enough water will still reach the wetland.
- xv. It is suggested that erosion measures be implemented to minimize the impact of siltation during construction and operational phase.

- xvi. The correct erosion measures should be implemented at the storm water outlets to ensure that the soil don't wash into the wetland or artificial dam.
- xvii. No accumulation of surface water must be allowed around the perimeter of the proposed structures and the entire development must be properly drained.
- xviii. The layout of the roads and parking areas must take into account, the natural topography which makes it possible to minimise erosion and minor floods by routing the run-off towards the low lying drainage areas of the natural topography.
- xix. Planting of trees, aesthetic gardens and lawns by residents is recommended, as it will serve to minimise the amount of runoff.
- xx. Proper maintenance of the watercourse areas must be done during both the construction and the operational phase of the project. Specific attention must be given to the eradication of weeds and alien invasive plant species.

9.2.2 Ground water:

Construction phase:

During the construction phase the following activities will have an impact on the ground water:

- The washing and cleaning of any chemical compounds such as paint, petrol, oil and other chemicals on bare soil will result in contaminants infiltrating the ground and resulting in soil pollution.
- Spillages (fuel, oil, chemicals) will infiltrate the ground contaminating both the soil and ground water.
- Mixing or spilling of cement.
- Poor management of storm water runoff.
- Compaction will prevent water from infiltrating into the soil.
- If ablution facilities are not secured properly it could fall over and result in spillage which will pollute both the soil and the ground water.
- Washing up (bathing, hand washing and washing of dishes / containers).
- Washing of vehicles / machinery.
- Maintenance or fixing of vehicles / machinery.

Operational phase:

During the operational phase there will be a higher percentage of impervious surfaces than before the development. As a result there will be more runoff water and less water filtering into the soil, this will result in a change of the water table. There is also the possibility of spills such as fuel and oils that could contaminate the ground water. Building activities, such as the mixing of cement on soil, will have a

negative impact on both the soil and the ground water. Fertiliser can also play a very negative role if not used correctly.

Table 11: Impact Assessment of the Ground Water

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Intensity	Medium	Medium
Probability	Possible	Possible
Significance	Low	Low
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Medium	Medium
Degree of irreplaceable loss of resources	Medium	Low
Degree to which the impact can be mitigated	Medium	Medium

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. No paint tins or rollers are allowed to be washed out on bare soil – washing may occur in a drum of water, which must be emptied into a disposable drum as part of building rubble (hazardous material) and not tipped onto the soil.
- ii. Should temporary fuel storage be used on site, the containers must be placed on a concrete slab / impervious surface in order to prevent infiltration of fuels into the ground in case of accidental spillages. A binding wall on all sides must surround the slab / impervious surface.
- iii. Any contact of fuels with the bare soils must at all cost be avoided. Should there be any spillages on the ground, immediate rehabilitation must be done.
- iv. Empty containers of chemicals must be stored in a bin that is marked as hazardous waste.
- v. No mixing of cement on soil surfaces. Drip trays and plastic must be provided. If wheelbarrows are used it must be parked on plastic to avoid any spillages on soil.
- vi. Spill kits must be provided on site. A spill kit must include the following:
 - a. Protective clothing;
 - b. Absorbing and cleaning agents such as sand, sawdust, absorbent pads/pellets, kitty litter, mops, brooms and rags;
 - c. Portable bunds to direct spills or was-water away from drains to clean-up areas

- d. Shovels, brooms and dustpans to sweep up solid or powder spills.
- vii. Cement must be stored in a locked container.
- viii. A proper storm water management plan must be provided.
- ix. Washing of vehicles must take place in a designated area that has a proper drainage system and storm water management. Water from this area must be contained and removed as part of the construction rubble or must be recycled.
- x. Maintenance or fixing of vehicles must take place on impervious surfaces or on a drip tray.
- xi. Ablution facilities must be properly secured and located far away from the environmental sensitive areas.
- xii. Proper facilities must be provided for washing up so as to avoid contamination of the soil and the ground water. Water from this area cannot be drained into the natural watercourse and must be contained or drained into the municipal structures.
- xiii. Planting of trees, aesthetic gardens and lawns by residents is recommended, as it will serve to minimise the amount of runoff.

9.2.3 Soil / Geology:

As indicated by Wetland Consulting Services (2011) the site was previously used for agricultural activities (peaches) as well as for sand mining. Both these activities had a negative impact on the environment and contributed to the state of the soil / geology on site. The topsoil was removed and has exposed the soil to erosion which is evident when walking along the wetland areas. Areas of hard rock / soil are currently exposed and the vegetation is not adapting / growing on these hard areas. Refer to photographs below for illustration of the impact of previous activities on site.



Photograph 11: Hard soil surfaces exposed and soil erosion taking place



Photograph 12: Erosion gully / channel that formed due to poor management and previous human activities



Photograph 13: Vegetation are struggling to establish on the hard soil



Photograph 14: Soil erosion taking place



Photograph 15: Exposure of hard soil surfaces and soil erosion



Photograph 16: Hard soil surfaces exposed, vegetation struggle to establish and erosion taking place

Construction:

The construction phase of the project will have an impact on the topography of the area due to excavation for services and foundations, cutting for construction of roads, creating platforms for houses and flattening of areas. Activities that will have an impact on the soil include:

- Removal of vegetation will expose the soil to erosion, pollution and dust creation.
- The washing and cleaning of any chemical compounds such as paint, petrol, oil and other chemicals on bare soil will result in contaminants infiltrating the ground and resulting in soil pollution.
- Spillages (fuel, oil, chemicals) will infiltrate the ground contaminating both the soil and ground water.
- Mixing or spilling of cement on soil surfaces.
- If the storm water runoff is not controlled it will result in erosion and siltation.
- Compaction will prevent water from infiltrating into the soil and will lead to runoff and soil erosion.
- Unmitigated soil stockpiles will result in dust, erosion and washing away of soil.
- If ablation facilities are not secured properly it could fall over and result in spillage which will pollute both the soil and the ground water.
- Washing up.
- Washing of vehicles / machinery.
- Maintenance or fixing of vehicles / machinery.

Operational:

During the operational phase spillages (oil, fuel, cement, and paint) will have a negative impact on the soil and will result in soil contamination. Other negative impacts are the incorrect use of fertiliser, exposure of soil surfaces, poor storm water management and compaction.

Table 12: Impact Assessment of the Soil / Geology

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Medium term	Medium term
Probability	Definite	Probable
Intensity	Medium	Medium
Significance	Moderate	Low
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Medium	Medium

Degree of irreplaceable loss of resources	Medium	Medium
Degree to which the impact can be mitigated	Medium	Medium

Refer to Appendix H for the detailed Impact Assessment The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. Vegetation must be removed in phases as construction continues and not all at once.
- ii. Excavations must be according to Geotechnical recommendation.
- iii. A competent person must inspect excavations for foundations during construction in order to verify that the materials exposed are not at variance with those described in the Geotechnical Report.
- iv. The placement of the fill must be controlled with suitable field tests to confirm that the required densities are achieved during compaction and that the quality of the fill is within the specification.
- v. No paint tins or rollers are allowed to be washed out on bare soil – washing may occur in a drum of water, which must be emptied into a disposable drum as part of building rubble (hazardous material) and not tipped onto the soil.
- vi. Empty chemical containers must be placed in a bin marked as hazardous waste and dumped at a registered hazardous waste site or collected by a registered company that will take it to a waste site.
- vii. Should temporary fuel storage be done on site, the containment must be in a place covered with a concrete slab in order to prevent infiltration of fuels into the ground in case of accidental spillages. A binding wall on all sides must surround the slab.
- viii. Any contact of fuels with the bare soils must at all cost be avoided. Should there be any spillages on the ground, immediate rehabilitation must be done.
- ix. Spill kits must be provided on site. A spill kit must include the following:
 - a. Protective clothing;
 - b. Absorbing and cleaning agents such as sand, sawdust, absorbent pads/pellets, kitty litter, mops, brooms and rags;
 - c. Portable bunds to direct spills or was-water away from drains to clean-up areas
 - d. Shovels, brooms and dustpans to sweep up solid or powder spills.
- x. Empty containers of chemicals must be stored in a safe place. They must not be left lying on the ground.
- xi. Cement must be stored in a locked container.
- xii. No mixing of cement on soil surfaces. Drip trays and plastic must be provided. Wheelbarrows can also be used but the wheelbarrows must stand on plastic so as to avoid spillage on the ground.

- xiii. Topsoil must be stored and either be covered with vegetation (hydro-seeded) or with a net / hessian.
- xiv. A proper storm water management plan must be provided.
- xv. Washing of vehicles must take place in a designated area that has a proper drainage system and storm water management. Water from this area must be contained and removed as part of the construction rubble or must be recycled.
- xvi. Maintenance or fixing of vehicles must take place on impervious surfaces or on a drip tray.
- xvii. Ablution facilities must be properly secured and located far away from the environmental sensitive areas.
- xviii. Proper facilities must be provided for washing up so as to avoid contamination of the soil and the ground water. Water from this area cannot be drained into the natural watercourse and must be contained or drained into the municipal structures.

9.2.4 Air quality:

The proposed study site is adjacent to the existing Diepsloot West Township. The air in the area is considered to be polluted as the Diepsloot West Township creates air pollution through dust, smoke and ash. A part from the air pollution caused by Diepsloot West Township there is also the cement mine/ industry to the north-west (approximately 1km from the site) of the development as well as the construction activities taking place to the south (approximately 3km from the site) of the proposed project site.



Photograph 17: Air pollution over Diepsloot West Township

Construction phase:

The main impact on air quality during construction phase will be through dust. Construction vehicles on dirt roads together with earthworks can blow the dust into the atmosphere. Emission of smoke from large

construction vehicles will also contribute to air pollution. Other impacts will result from waste blowing through the air, cement from cement bags or the mixing thereof and smoke from fires.

Operational phase:

The operational phase will have a negative impact on air quality through dust and smoke from fires. It is however anticipated that there will be less fires during the operational phase as electricity will be provided. Even though electricity will be provided, the proposed project will still contribute to the cumulative impact of the activities on the air quality.

Table 13: Impact Assessment of the Air Quality

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Probability	Definite	Probable
Intensity	Medium	Medium
Significance	Moderate	Low
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	N/A
Degree of irreplaceable loss of resources	Medium	N/A
Degree to which the impact can be mitigated	Medium	N/A

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. Removal of vegetation during construction must take place in phases so as to minimise the amount of soil exposed to wind and other environmental elements.
- ii. The construction site must be watered in order to prevent dust being blown into the atmosphere. Other dust suppression techniques can also be used if more efficient and cost effective.
- iii. Care must be taken not to over-water the areas and cause erosion and structural damage to the soil.
- iv. Topsoil stockpiles should be seeded with a grass mix to protect the soil from blowing away if the stockpile is not to be used within 3 months.

- v. Other stockpiles and building material should be wetted down or covered if they are prone to dust blowing off these items.
- vi. No fires will be allowed on site.
- vii. Ensure that no waste is burnt on the premises or on surrounding premises.
- viii. Cement bags must be collected at the end of each day.
- ix. Cement bags must be placed in bins with a lid so as to avoid the bags from blowing through the air.
- x. Enough bins must be provided on site and regular site clean ups must be held.
- xi. Waste must be collected on a weekly basis.
- xii. Vehicles used for construction are to be in good working condition.
- xiii. Vehicles transporting soil must be covered so as to avoid soil blowing into the air.
- xiv. Planting of trees or vegetation screens will assist with the collection of dust.
- xv. Community members must be informed of the health implications of dust.
- xvi. Community members must be encouraged to plant vegetation in order to mitigate dust.
- xvii. The community members must be informed of the impact fire has on the environment especially on the wetland areas.

9.2.5 Visual Impact:

The proposed site is surrounded by different land uses. To the west of the proposed site is the Diepsloot West Township, to the south of the site are mixed land users and to the east of the site are agricultural smallholdings. Although the area to the east has an aesthetical pleasing environment the site to the west (Informal Settlement) spoils the aesthetical beauty of the overall area.

The rehabilitation of the wetland and bullfrog habitat as well as the addition of parks and trees might soften the potential negative visual impact of the proposed development.

It should be noted that even if a wall and vegetation screen is constructed around the proposed development it will not screen the development completely from the surrounding viewers. The main reason for this is due to the rolling topography of the area as well as the proposed site.

Construction phase:

During the construction phase of the project the visual impact will result from the removal of vegetation, construction of the residential development, waste as well as from dust created during construction. Should there be any fires on site the smoke will contribute to the visual impact during the construction phase of the project.

Operational:

During the operational phase the visual impact will be as a result of the residential development. Other factors such as smoke and waste will contribute to the overall visual impact of the development.

The following visual assessment criteria have been used to determine the impact of the proposed new development on the state of the environment.

Table 14: Visual Impact Assessment Criteria

Criteria	Impact		
	High	Medium	Low
1. Visibility	A particularly definite place with an almost tangible dominant ambience or theme	A place which projects a loosely defined theme or ambience	A place having little or no ambience with which it can be associated
2. Visual Quality	A very attractive setting with great variation and interest but no clutter	A setting which has some aesthetic and visual merit	A setting which has little or no aesthetic value
3. Surrounding Landscape Compatibility	Cannot accommodate proposed development without it appearing totally out of place visually	Can accommodate the proposed development without appearing totally out of place	Ideally suits or matches the proposed development
4. Character	The site or surrounding area exhibits a definite character	The site or surrounding area exhibits some character	The site or surrounding area exhibits little or no character
5. Visual Absorption Capacity	The ability of the landscape not to accept a proposed development because of a uniform texture, flat slope and limited vegetation cover	The ability of the landscape to less easily accept visually a particular type of development because of a less diverse landform, vegetation and texture	The ability of the landscape to easily accept visually a particular type of development because of its diverse landform, vegetation and texture
6. View Distance	If uninterrupted view distances to the site are > than 5km	If uninterrupted view distances to the site are < than 5km but > 1km	If uninterrupted view distances to the site are > than 500m and < 1000m
7. Critical Views	Views of the site seen by people from sensitive view sheds, e.g. farms, nature areas, hiking trails, etc.	Some views of the site from sensitive view sheds	Limited or partial views to the site from sensitive view sheds

Table 15: Impact Assessment of Visual Impact

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term to Permanent	Short term to Permanent

Probability	Highly probable	Possible
Intensity	High	High
Significance	Moderate	Moderate
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Medium	Low
Degree of irreplaceable loss of resources	High	High
Degree to which the impact can be mitigated	High	Low

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. No fires on site excepts when it is a formalised fire for a braai or function.
- ii. Dust suppression techniques must be implemented.
- iii. Vegetation clearance must take place in phases so as to avoid soil surfaces being exposed.
- iv. Waste collection must be done on a regular basis during construction and operational phases of the project.
- v. Recycling programmes must be implemented to encourage residents to keep their neighbourhood clean.
- vi. During construction an area for waste stockpiles must be identified within the construction office area.
- vii. It is recommended that a vegetation screen be constructed along the wall of the residential; development so as to assist with screening of the residential development.

9.2.6 Sensitive Landscapes:

A wetland runs through the study site and to the southern section of the site is the giant bullfrog habitat.

Construction phase:

Construction waste, litter and soil washed off by runoff during construction phase can be deposited into the wetland / drainage line and even within the Giant Bullfrog habitat area. Construction vehicles could damage the sensitive areas if they drive through the area or even while busy with construction within the sensitive areas. It is thus essential to demarcate and fence these areas prior to construction. During construction workers could trap animals or cut wood, this should be prevented at all times. Other concerns are chemical spills such as oil, fuel and cement within these sensitive areas. Mixing / batching

of cement within sensitive areas have a huge impact on the soil and ground water. Fires will also have a negative impact.

Operational:

During the operational phase there will be a negative impact on these sensitive areas by littering, fires and the discharge of storm water. There is also the possibility that garden plants as well as alien and invasive species will distribute to the sensitive areas. Other impact can result from pedestrians crossing the sensitive areas or from people using it as a 'Place of Worship'.

Table 16: Impact Assessment of the Sensitive Areas: Wetland and Giant Bullfrog Area

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term to Permanent	Short term to Permanent
Probability	Highly probable	Possible
Intensity	High	High
Significance	Moderate	Moderate
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Medium	Low
Degree of irreplaceable loss of resources	High	High
Degree to which the impact can be mitigated	High	Low

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- viii. Sensitive environments must be fenced off properly. Refer to the Giant Bullfrog EMP for specifications regarding the fencing of the giant bullfrog area.
- ix. Soil erosion must be avoided at all cost. This will also help to prevent accumulation of eroded materials into the wetland.
- x. A proper storm water management plan must be implemented during the construction as well as the operational phase of the project.
- xi. No maintenance of construction vehicles / machinery on site.

- xii. No mixing of cement on impervious surfaces. Mixing of cement must be on a proper drip tray with a slightly higher edge. Wheelbarrows can also be used but the wheel barrows must be in a good working condition with no holes and a properly working wheel.
- xiii. No mixing of cement on plastic. Plastic can however be used underneath the drip tray or wheelbarrow.
- xiv. Contractors, subcontractors and all the workers must be instructed not to use the sensitive areas as dumping sites.
- xv. The appointed ECO must indicate where dumping can take place.
- xvi. Site clean-up must be done on a weekly basis.
- xvii. Enough toilets must be provided during the construction period.
- xviii. The ECO must indicate where the toilets can be located.
- xix. Workers must be educated on the importance of the sensitive areas.
- xx. No fires on site excepts when it is a formalised fire for a braai or function.

9.3 SOCIO ECONOMIC IMPACTS

Socio-economic impacts of the development on surrounding residents, residents that will be staying in the proposed development, construction workers and people passing by are anticipated during the construction and the operational phase of the project. The following concerns will be addressed:

- Health
- Noise
- Odour
- Traffic
- Safety and Security
- Property value
- Cultural resources
- Public response

9.3.1 Health impacts:

The site is currently being used as an illegal dumping site and sanitation facility. By developing the area there will no longer be an opportunity for illegal dumping and using the site as open air toilets. This will improve the hygiene of the area and of the people living there. It is however important that the wetland and bullfrog habitat areas be fenced off to prevent illegal dumping, washing and the use of the area as a toilet. Other health impacts currently associated with the area is smoke caused by veld fires as well as smoke from fires used for cooking or heat.

Construction:

During the construction phase the proposed development will have a negative impact on the local community. Dust from construction site will affect the properties and community within and around the area as well as the construction workers. Other health risk during construction is if workers don't wear the correct Personal Protective Equipment (PPE) such as dust masks when mixing cement. During the construction phase hand washing soap and toilet paper must be provided at the toilets on site, it is suggested that the toilets with basins be provided. Enough toilets must be provided. It is essential that personal hygiene and diseases such as human immunodeficiency virus (HIV) and sexual transmitted diseases (STD) be discussed at the toolbox talks.

Proper eating areas and drinking water must be provided on site and enough waste bins must be located throughout the construction site and around the eating areas.

Waste must be collected on a regular basis and all hazardous waste must be taken to a register landfill site that can deal with hazardous waste.

Operational:

During the operational phase there is a possibility that there could be smoke caused by fires; this is however not anticipated as electricity will be provided. Other health impacts could be due to the pollution of the wetland areas, insufficient or inadequate waste removal and if public space is used as toilets.

Table 17: Impact Assessment of Human Health

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Probability	High	High
Intensity	Medium	High
Significance	Medium	Medium
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	N/A	N/A
Degree to which the impact can be mitigated	High	Moderate

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. The construction site must be watered in order to prevent dust being blown into the atmosphere. Other dust suppression techniques can also be used if more efficient and cost effective.
- ii. Under no circumstances may ablutions occur outside of the provided facilities.
- iii. Proper ablution facilities must be provided, including toilet paper and hand washing liquid.
- iv. Proper facilities / areas for lunch must be provided.
- v. Drinking water must be provided. The drinking water must be indicated by a sign in order for all workers to understand and use. The drinking water must be available on site and should be in a shaded area.
- vi. Proper PPE must be provided to all workers on site,
- vii. Toolbox talks must include PPE, personal hygiene as well as diseases.
- viii. No fires on site.
- ix. Land owners must be informed of the health risk associated with dust and must be motivated to plant vegetation so as to avoid dust creation.
- x. Community facilities must have proper public notices to inform the public on different diseases and how it is spread.
- xi. Proper Municipal services must be provided to ensure that waste is collected on a regular basis and that the sewer system is working.
- xii. Water from the wetland systems must be monitored to ensure that the water quality is acceptable.

9.3.2 Noise:**Construction phase:**

There will be an increase in ambient noise levels during the construction phase. This will be due to the sound of construction vehicles and their reverse hooters as well as the construction activities. There will be no site accommodation and therefore there shouldn't be noise from the site in the evenings except when doing construction.

Operational phase:

During the operational phase there will be an increase in noise ambient as the residential area of Diepsloot would have increased. The noise during the operational phase could be from kids, soccer matches or other sport events, social events and taxis.

Table 18: Impact Assessment of Noise

Phase of development	Construction Phase	Operational Phase
Extent	Site Specific	Local
Duration	Short term	Long term

Probability	Definite	Probable
Intensity	Medium	Medium
Significance	Moderate	Moderate
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	N/A	N/A
Degree to which the impact can be mitigated	Low	Low

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. Construction activities and in particular reverse hooters on vehicles cannot be restricted beyond adhering to acceptable working hours, i.e. 7am – 6pm weekdays.
- ii. No work should take place on Public Holidays or over a weekend. Should work take place over a weekend or public holiday it should be from 8am – 5pm on a Saturday and from 8am – 1pm on a Sunday.
- iii. Construction vehicles should be restricted to one access route that has the least impact on surrounding areas.

9.3.3 Odour:

Construction phase:

During the construction period odour could become a concern if burning takes place on site. Burning of material on site could result in bad smells but will be limited to the site.

Operational phase:

During the operational phase there could be an increase in different smells / odours from the residential development. This can be as a result of burning taking place on site. It is not anticipated that there will be any odour concerns from the Northern WWTW. The Northern WWTW is located approximately 2km south-west of the proposed residential development and therefore falls outside the 500m buffer zone of potential influence of the Northern WWTW, refer to Figure 10 below. Other impacts could be due to the sewer systems not working effectively due to an increase in the demand.

Table 19: Impact Assessment of Odour

Phase of development	Construction Phase	Operational Phase
Extent	Site Specific	Site Specific
Duration	Short term	Long term
Probability	Definite	Probable
Intensity	Low	Low
Significance	Low	Very Low
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	N/A	N/A
Degree to which the impact can be mitigated	Low	Low

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. No burning of material on the construction site.

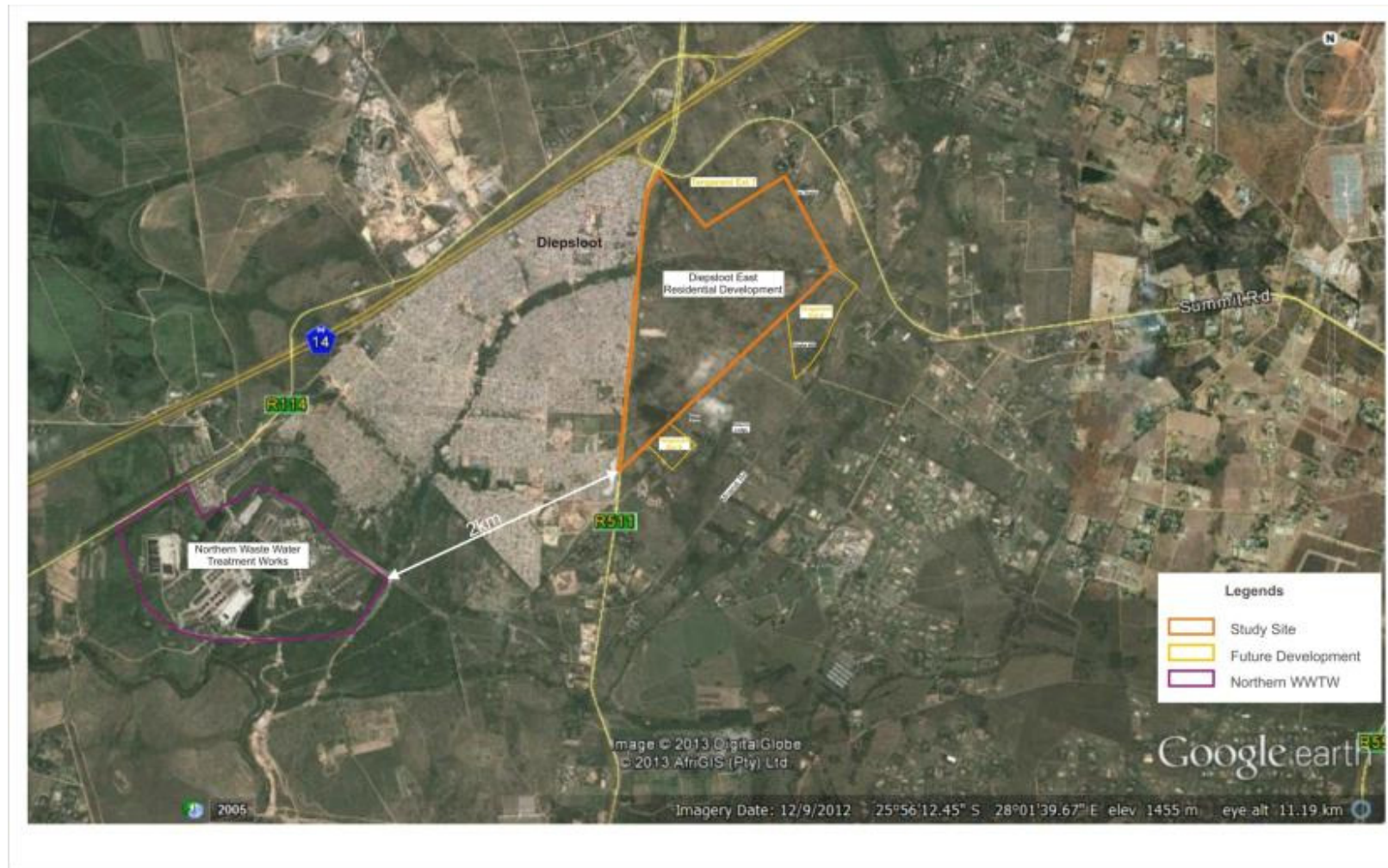


Figure 10: NORTHERN WWTW: Diepsloot East Residential Development



Figure 10: Illustration of the distance between the Northern WWTW and the Diepsloot East Residential Development

9.3.4 Traffic:

Construction phase:

During the construction phase there will be an increase in traffic, especially heavy vehicle traffic. It is anticipated the most of the labourers will be local labour and therefore there will be an increase in pedestrian traffic from Diepsloot West to the Diepsloot East Residential Development. This will become a high risk for accidents on William Nicol Drive / R511. The construction activities will create dust which could have a negative impact on the visibility on local roads, especially on William Nicol Drive / R511. Traffic congestions will be created where intersections need to be upgraded or where heavy vehicles need to access or leave the construction site.

In order to avoid / minimise the impact the development will have on traffic during the operational phase an alternative access route will be used. The access will be from the property (Portion 119 of the farm Diepsloot 388 JR) bordering the northern section of the proposed site. Summit Road will therefore form the main access route to the site and therefore the traffic impact on William Nicol Drive / R511 should be less than anticipated.

Refer to Figure 11 below for the alternative access route to the proposed site.

Operational phase:

During the operational phase it is anticipated that there will be a slight increase in traffic as well as pedestrian traffic. This will have a negative impact on the roads surrounding the development as these roads will not be able to handle the load. The Traffic Impact Assessment suggested the upgrade of the surrounding roads as well as the intersections.

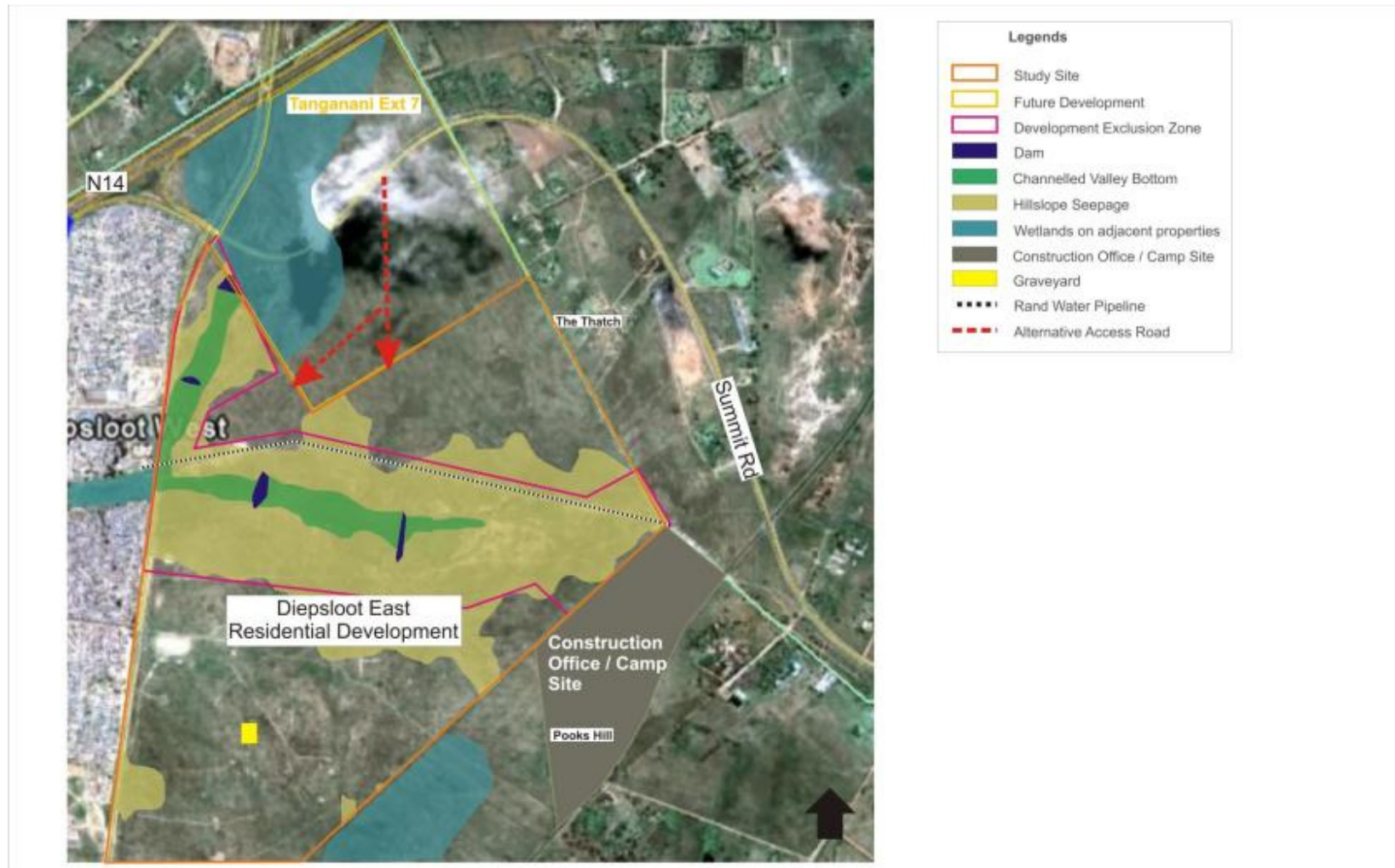


Figure 10: ALTERNATIVE ACCESS ROAD: Diepsloot East Residential Development



Figure 11: Alternative access road to Diepsloot East Residential Development - construction site

Table 20: Impact Assessment of Traffic

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Short term	Long term
Probability	Definite	Definite
Intensity	High	High
Significance	Moderate	Moderate
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	N/A	N/A
Degree to which the impact can be mitigated	Medium	Medium

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. Dust suppression techniques must be implemented.
- ii. Public / workers must be informed of road safety.
- iii. Traffic control must take place during the construction period.
- iv. Traffic signs must be erected to warn motorists of the construction activities.
- v. Using an alternative access road would mitigate some of the traffic congestions experienced on William Nicol Drive / R511.
- vi. Upgrade of the surrounding roads and intersections.

9.3.5 Safety and Security:

Construction phase:

During the construction period safety and security is a high risk. If the site is not secured properly there could be an increase in theft not only on construction site but also in the surrounding area. There is also the possibility of kids accessing the site and playing on stockpiles or with equipment. Open trenches must be demarcated to avoid people from falling into the trenches. Staff members must be treated fairly in order to avoid dispute between staff members as well as strikes. Safety is a concern as inappropriate

working methods and equipment will lead to injuries. There is also the risk of staff / workers being injured when crossing William Nicol Drive / R511 to get to the construction site. Other safety risk could occur when people are not wearing the correct Personal Protective Equipment (PPE).

Operational phase:

During the operational phase safety and security could become a risk when people are misbehaving. There is also the potential of theft in the area. Other risks are associated with the potential increase in traffic, pedestrians crossing over busy roads such as William Nicol Drive / R511 and the internal roads of the Diepsloot East Residential Development.

Table 21: Impact Assessment of Safety and Security

Phase of development	Construction Phase	Operational Phase
Extent	Site Specific	Local
Duration	Short term	Long term
Probability	Definite	Probable
Intensity	Medium	Medium
Significance	Moderate	Moderate
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	N/A	N/A
Degree to which the impact can be mitigated	Low	Low

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. The construction site must be properly fenced off. If at all possible a more permanent fence should be used, such as palisade fencing.
- ii. Fencing must be checked on a daily basis to ensure that the fence is not broken.
- iii. A Security Company must be appointed to secure the area.
- iv. Access to the site must be controlled by the Security Company.
- v. The laydown areas must be secured within the construction camp site.
- vi. Staff must be treated fairly to avoid any disputes or strikes.

- vii. A CLO must be appointed to assist with the communication between the workers and the contractor.
- viii. All open trenches must be barricaded with orange safety net.
- ix. Open trenches should be closed within a 48 hour period.
- x. Workers / staff must be educated regarding the road rules.
- xi. Workers / staff members must be trained in using equipment.
- xii. Equipment must be serviced on a regular basis.
- xiii. All workers/ staff members must be issued with their on PPE.
- xiv. Construction / danger signs as well as traffic signs must be erected all over site.
- xv. The Occupational Health and Safety Act No 85 of 1993 must be adhered to.

9.3.6 Property value:

The proposed development could have both a negative and positive impact on property value within the area. The property value will be negatively impacted by the high density residential area if concerns such as crime, waste, destruction of natural systems, visual and noise is not addressed properly or mitigated successfully. The residential development could however also create business opportunities, properties being sold to developers for the development of more residential units or commercial / industrial areas.

It is essential that mitigation measure be implemented during the construction and the operational phases of the project to ensure that the property value of the surrounding properties is not influenced dramatically.

9.3.7 Impact on cultural resources:

Cultural resources are finite and non-renewable. Any destruction to the cultural resources in the area may result in permanent damage and even permanent loss of heritage resources. Modern development has been a major factor in the destruction of heritage resources. Graves have been found in the area earmarked for development and include approximately 100 graves.

Construction:

Earthworks may expose buried archaeological / historical features and could therefore damage some of the historical features (graves). If the graves are not fenced off there is the possibility that construction vehicles can drive over the graves or that the graves can be vandalised. The grave site must be fenced off in order to protect the graves during the construction period.

Operational:

During the operational phase there is always a possibility that the archaeological / historical features could be vandalised. If the graves are not fenced off it could also pose a danger for kids playing in the area. It is therefore essential that the graves be fenced off during the operational phase of the project.

Table 22: Impact Assessment on Cultural Resources

Phase of development	Construction Phase	Operational Phase
Extent	Local	Local
Duration	Permanent	Permanent
Probability	Definite	Definite
Intensity	Very High	Very High
Significance	High	High
Status	Negative	Negative
Confidence	Total	Total
Degree to which the impact can be reversed	Low	Low
Degree of irreplaceable loss of resources	High	High
Degree to which the impact can be mitigated	High	High

The information in the table above is for the worst case scenario and before any mitigation, refer to Appendix H for the detailed Impact Assessment

Mitigation Measures:

- i. During construction the grave site must be fenced off with a proper fence and gate to allow access for people visiting the graves.
- ii. It is suggested that chicken wire fence be used and that the fence should be at least 1.8m in height. The fence can also be marked with a yellow safety tape or the orange netting to ensure that truck drivers see the fence.
- iii. It should be kept in mind that archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during construction activities, such activities should be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (*cf.* NHRA (Act No. 25 of 1999), Section 36 (6)).
- iv. During the operational phase of the project the fence can be replaced by a more permanent fence with a gate.
- v. Maintenance of the area must take place to ensure that the area is not overgrown by alien invasive plant species and weeds.

9.3.8 Public Response:

Construction:

Construction activities are likely to generate an increased amount of public response and issues. The public should be kept informed of progress and activities that may affect them at all times. It is essential that during the construction period construction signs be erected around the proposed site especially on the roads surrounding the site.

Operational:

During this phase all the concerns and issues should have been addressed and further public response should be minimal.

Mitigation Measures:

- i. The public must be kept informed of activities happening on site such as blasting.
- ii. Roads signs and proper traffic control must take place.
- iii. Mitigation measures as suggested in the EIA Report and the EMP must be adhered to.
- iv. The Community Liaison Officer (CLO) must have a good working relationship with the councillors of Diepsloot and surrounding areas as well as the Home Owner Associations in the area.

Table 233: Summary of the Environmental Impacts for the proposed Diepsloot East Residential Development.

Affected Environment		Before Mitigation						After Mitigation						Impact Description
		UN-CERTAIN	HIGH NEG.	MED NEG.	LOW NEG.	POSITIVE	NO IMPACT	UN-CERTAIN	HIGH NEG.	MED NEG.	LOW NEG.	POSITIVE	NO IMPACT	
BIOLOGICAL IMPACTS														
Flora	CONST			x							x			Loss of vegetation Destruction of remaining vegetation Rehabilitation of wetland areas Planting of indigenous vegetation.
	OPERA			x								x		
Fauna & Birds	CONST			x						x				Alteration and loss of habitat. Rehabilitation of wetland areas. Planting of indigenous vegetation which might increase the biodiversity of birds and animals. Fencing of the bullfrog habitat which might lower the probability of bullfrogs being eaten by people in the area.
	OPERA			x								x		

PHYSICAL IMPACTS														
Surface Water	CONST			x						x				Degradation of water quality. Increase in water runoff.
	OPERA			x						x				There might be an increase of the water in the wetland area due to rehabilitation of the area and thus more wetland plants.
Ground Water	CONST			x						x				Groundwater pollution.
	OPERA			x						x				
Soil	CONST			x							x			Soil pollution. Loss of top soil while being stock piled.
	OPERA			x							x			Erosion Increase in soil quality of the wetland areas after rehabilitation.
Air quality	CONST			x							x			Odours. Dust during the construction period.
	OPERA			x							x			Decrease in veld fires Decrease in smoke due to availability of electricity
Sensitive landscapes	CONST			x							x			Degradation of sensitive areas if the areas are

	OPERA			x						x			not properly fenced off during construction. Rehabilitation of the sensitive area.
Visual Impact	CONST			x						x			Semi-complete structures, rubble, construction activities during construction period.
	OPERA			x						x			
SOCIO ECONOMIC IMPACTS													
Health Impacts	CONST			x						x			Dust blow-off during the construction period. Hygiene will no longer be a problem as wetland can't be used for sanitation facilities. Decrease in illegal dumping.
	OPERA			x						x			
Noise	CONST			x						x			Noise from the construction and the operational phase. Noise would include construction vehicles, construction activities and general noise associated with residential areas.
	OPERA			x						x			
Odour	CONST			x						x			Odour from the construction phase as well as the operational phase
	OPERA			x						x			

Traffic	CONST			x							x			Traffic congestion caused due to construction vehicles.
	OPERA			x							x			
Safety and Security	CONST			x							x			There might be an increase in property values.
	OPERA			x							x			
Impact on Cultural Resource	CONST		x								x			Damage to- or loss of historical artefacts if not correctly mitigated.
	OPERA						x						x	

CONST. = CONSTRUCTION PHASE
 OPERA. = OPERATIONAL PHASE

Table 24: Comparative Assessment of the positive and negative impacts of the proposed Diepsloot East Residential Development.

Environmental Implication of the Proposed Diepsloot East Residential Development.		
Affected Environment.	Positive Implication.	Negative Implication.
Flora	The already existing vegetation of the proposed site and wetland areas are degraded and will be rehabilitated with indigenous vegetation. The exotic vegetation species will be removed. Indigenous trees to be planted in the parks and on the pavements.	Most of the plants will be removed during the construction phase of the project which will result in the loss of habitats.
Fauna & Birds	The wetland will be rehabilitated and there will thus be an increase in animal and bird biodiversity. Indigenous trees will be planted throughout the development which might increase the bird biodiversity.	The animal and bird habitats will be disturbed during construction.
Surface Water	An increase in runoff might result in a higher volume of water damming in the wetland area and the artificial dam. Due to an increase in wetland area there might also be an increase in animal and bird life.	During the construction period the flow of the stream will be affected. There might be pollution during the construction phase, but this will be prohibited as far as possible.
Ground Water		The construction phase will have an impact on the groundwater.
Soil		During construction the topsoil will be removed temporarily. This could lead to the increase of weeds on these top soils. Other negative impacts will include the

<p>Air quality</p>	<p>There should be an improvement in air quality as electricity will be provided and therefore there shouldn't be a need for fires.</p>	<p>pollution caused due to spills, leakages and the mixing of cement. Compaction of soil will result in an increase in runoff water and the possibility of erosion. During construction the atmosphere will temporarily be polluted with dust and gasses from heavy vehicles.</p>
<p>Sensitive Landscapes</p>	<p>The sensitive landscape areas will stay protected and will be rehabilitated.</p>	<p>The negative impact will result due to the mismanagement of the sensitive areas.</p>
<p>Health Impacts</p>	<p>A clinic / hospital will be constructed as part of the development and will therefore provide extra medical care.</p>	<p>During construction there will be a health risk as dust will be generated during construction phase.</p>
<p>Noise</p>		<p>During the construction phase noise will be created by heavy vehicles and machinery.</p>
<p>Impact on Cultural Resources</p>	<p>All the graves will be protected.</p>	<p>Negative impacts can be as a result of vandalism.</p>

10 RECOMMENDATIONS

In order for the proposed development to be successful and to have the least negative possible impacts on the natural environment and socio – economic environment the following are recommended:

- An opportunity should be given to the residents of Diepsloot West Township to collect thatching grass before the site is cleared for construction;
- All recommendations and mitigation measures as per the specialist reports must be adhered to;
- A professional wetland consultant must be appointed to assist with the rehabilitation of the wetland areas;
- A professional landscape architect must be appointed to assist with the implementation of the LDP;
- The EMP must form part of the tender process / bill of quantity in order for contractors to budget accordingly;
- It is recommended that an independent Environmental Control Officer (ECO) be appointed to monitor all construction activities and to ensure that the contractor and sub-contractor comply with the EMP as well as the Bullfrog EMP;
- Residents that will be staying in Diepsloot East Residential Development should be informed of the environmental sensitive areas located within the development. This could be a similar approach as is currently used by Cosmo City whereby the residents undergo a short environmental induction and receives a certificate afterwards;
- Recycling facilities must be used, these can either be located at schools, sport fields or community facilities;
- NO activity can take place in the watercourse without the Water Use License;
- Local labourers must be used and it is suggested that the Noweto Chamber of Commerce and Industry be approached to assist with this.

11 CONCLUSION

There is a big need for housing, better services and jobs within the Diepsloot Community but also within the surrounding environments. There is also a great need and expectation to protect the natural environments within the fast growing urban areas and especially area located on the periphery of the urban and rural environments.

The Diepsloot East Residential Development Project Team has worked with the different stakeholders, authorities and the local community to ensure that the proposed project address both the social concerns as well as the environmental concerns. Although the proposed development will have a negative impact on the environment there is also the possibility for the development to positively affect the environment. This will however only happen if the mitigation measures and the recommendations, as mentioned in Section 9 and 10 are implemented successfully. It is essential that the Environmental Management Plan be implemented during construction but also during the operational period of the proposed development.

It is therefore requested that the project be authorised by the Department of Agriculture and Rural Development, in terms of the conditions and requirements of this report and that the development of the township be managed in terms of the recommendations as given in this report.

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