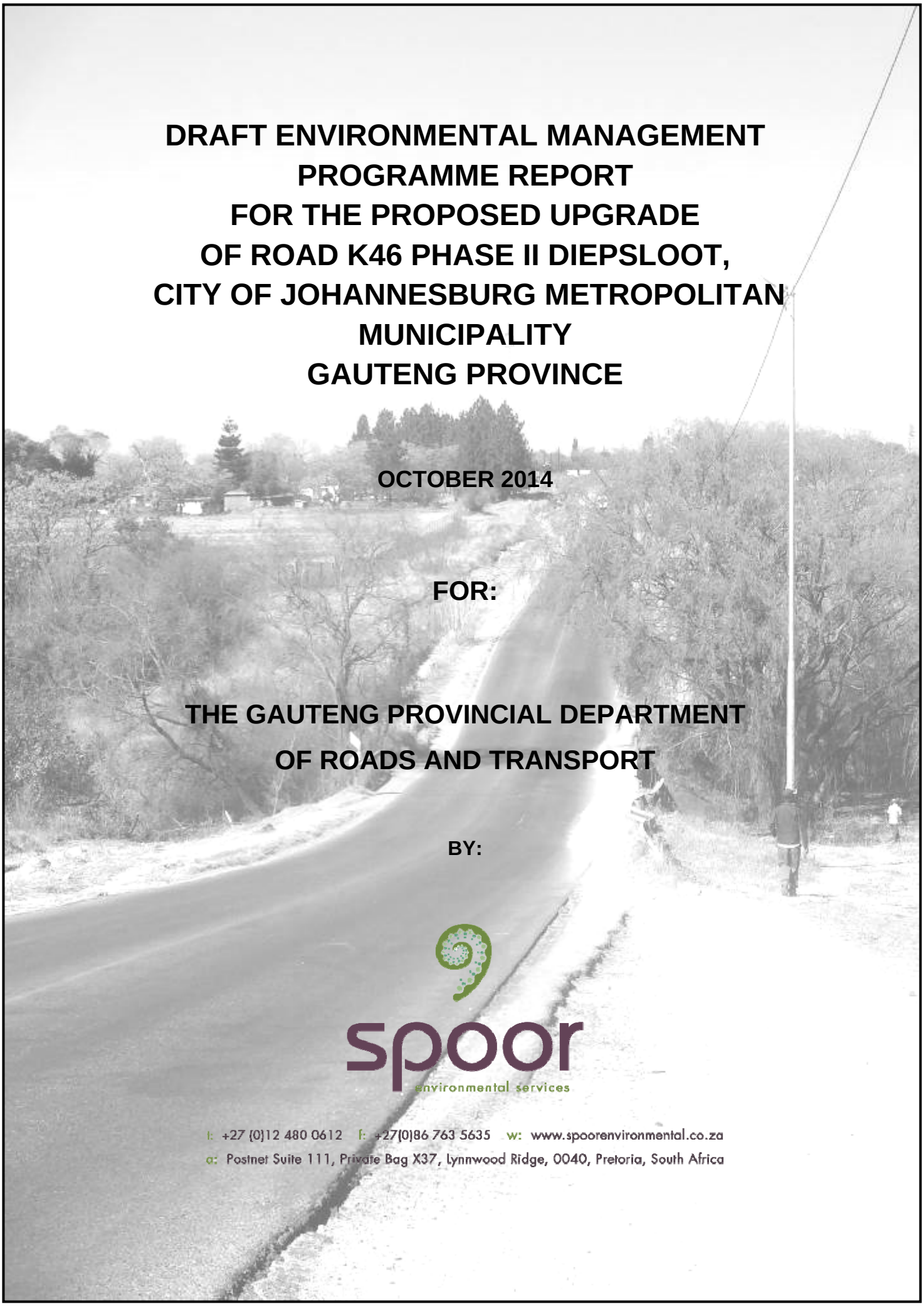
# APPENDIX H

DRAFT EMPr

# DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR THE PROPOSED UPGRADE OF ROAD K46 PHASE II DIEPSLOOT, CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY GAUTENG PROVINCE



**OCTOBER 2014**

**FOR:**

**THE GAUTENG PROVINCIAL DEPARTMENT OF ROADS AND TRANSPORT**

**BY:**

spoor environmental services

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| | |
|---|---|
| **REPORT TITLE:** | Draft Environmental Management Programme Report for the Proposed Upgrade of Road K46 Phase II Diepsloot, City of Johannesburg Metropolitan Municipality, Gauteng Province |
| **CLIENT:** | Knight Piésold Consulting Engineers |
| **REPORT STATUS:** | Draft |
| **SPOOR PROJECT REFERENCE:** | 8/15_k46 |
| **PLACE AND DATE:** | Pretoria, October 2014 |

## APPLICANT

| | |
|---|---|
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## ENVIRONMENTAL ASSESSMENT PRACTITIONER

| | |
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## DECLARATION OF INDEPENDENCE

I, JC van Rooyen as authorised representative of SPOOR Environmental Services hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor SPOOR Environmental Services (PTY) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SPOOR Environmental Services (PTY) Ltd. was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Proposed Upgrade of Road K46 Phase II Diepsloot, City of Johannesburg Metropolitan Municipality, Gauteng Province.

Signed…… Date……

## REPORT DISTRIBUTION LIST

| Name | Institution |
|---|---|
| N Buitendag | Gauteng Provincial Department of Roads and Transport |
| G Smit | Knight Piésold Consulting |
| E Schmidt | Johannesburg Roads Agency |
| L Molefe | Johannesburg Metropolitan Municipality :Environmental Management and Compliance Monitoring |
| L Siwelane | Department of Water Affairs |

## DOCUMENT HISTORY

| Report | Date | Version | Status |
|---|---|---|---|
| K46 PHASE II_EMPr_01 | June 2014 | 1.0 | Draft |
| K46 PHASE II_EMPr_02 | October 2014 | 2.0 | Draft |
| | | | |

# EXECUTIVE SUMMARY

SPOOR Environmental Services (PTY) Ltd. was appointed by Knight Piésold Consulting Engineers on behalf of the Gauteng Provincial Department of Roads and Transport as the Environmental Assessment Practitioner to manage the relevant environmental management processes related to the proposed development.

The project entails the second phase of the upgrade of the existing K46 (R511/ William Nicol road between the proposed PVW5 (Zeven Road Area) in the south and the N14 interchange (Summit road) in the north. A traffic analysis of the K46 William Nicol Drive corridor determined the most appropriate and cost effective road design to accommodate the anticipated traffic flows (15-20 years) as well as the most efficient interchange layout of William Nicol and the new planned east-west freeway (PWV5). The full extent of new developments (Steyn City, Century Riversands, Tanganani, Cradle City at Lanseria and Northern Farms developments), the anticipated 2030 Regional Road Network and Gauteng Province Planning Department was also taken into account.

Road K46 will be upgraded from the existing single lane in both directions to a duel carriage way (two to three lanes in each direction) with a road reserve of 62 metres. The proposed upgrade will furthermore extend over a distance of 6-7 kilometres. The upgrade project will include the relevant street furniture (e.g. street lighting, litter bins, traffic signage and safety barriers in the required areas), Bus and Taxi pick–up areas with associated structures, traffic signalling, storm water channels and discharge structures.

Comment during the public participation process revealed the requirement for pedestrian walkways alongside the R511. A 2.5m wide paved walkways on both sides of the alignment were subsequently included into the design. The proposed upgrade of the K46 will also include two water crossings over water courses. In both cases the crossings of the proposed road over the water courses will consist of a reinforced concrete box culvert structure.

In terms of ecological sensitivity the Specialist found that the majority of the project footprint does not pose the risk of noteworthy environmental degradation purely as a result of the situation that the road will be developed primarily within the exiting road reserves of the Diepsloot rural and residential area. The only section of the development footprint that was found to be sensitive was that included in the wetland and riverine areas. Socio-economic impacts include local ease of access, possible disruption in services, security and general hindrances. Specific impact mitigation measures were suggested for the management of these impacts and it is believed that the effects thereof can be significantly reduces if the measures are strictly adhered to.

The aim of this Environmental Management Programme Report is to ensure that the planning, assessment, construction and operational phases of the development comply with the relevant environmental legislation, regulations and guidelines. The Environmental Management Programme Report furthermore aims to organize and coordinate the proposed environmental management and mitigation measures and to describe these measures in order to prevent, reduce or otherwise manage the potential negative social and environmental impacts associated with the proposed development and to add to the favourable impacts of the project.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| BAR | Basic Assessment Report |
| COIDA | Compensation for Occupational Injuries and Diseases Act (No 130 of 1993) |
| CLO | Community Liaison Officer |
| DWA | Department of Water Affairs |
| EAP | Environmental Assessment Practitioner |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme Report |
| GDARD | Gauteng Department of Agriculture and Rural Development |
| GPDRT | Gauteng Provincial Department of Roads and Transport |
| IDP | Integrated Development Plan |
| ISDF | Integrated Spatial Development Framework |
| JRA | Johannesburg Roads Agency |
| PC | Principal Contractor |
| PM | Project Manager |
| RE | Resident Engineer |
| SAHRA | South African Heritage Resources Agency |
| SHE | Safety, Health and Environment |
| SME | Small and Medium Enterprises |
| H&S Rep | Health and Safety Representative |
| PPE | Personal Protective Equipment |

# 1. INTRODUCTION

SPOOR Environmental Services (PTY) Ltd. was appointed by Knight Piésold Consulting Engineers as the Environmental Assessment Practitioner to manage the relevant environmental management processes related to the proposed development. This Environmental Management Programme Report (EMPr) was developed in order to guide the relevant contractors and maintenance managers with regard to their responsibilities in terms of responsible environmental management during the construction phase of the proposed upgrade of Phase II of road K46 (R511 – William Nicol) between the proposed PWV5 (Zeven Road Area and the N14 Interchange to the North. See Figure 1. Finally, the EMPr must assist the Applicant in the management of the anticipated impacts during the operational phase of the project.

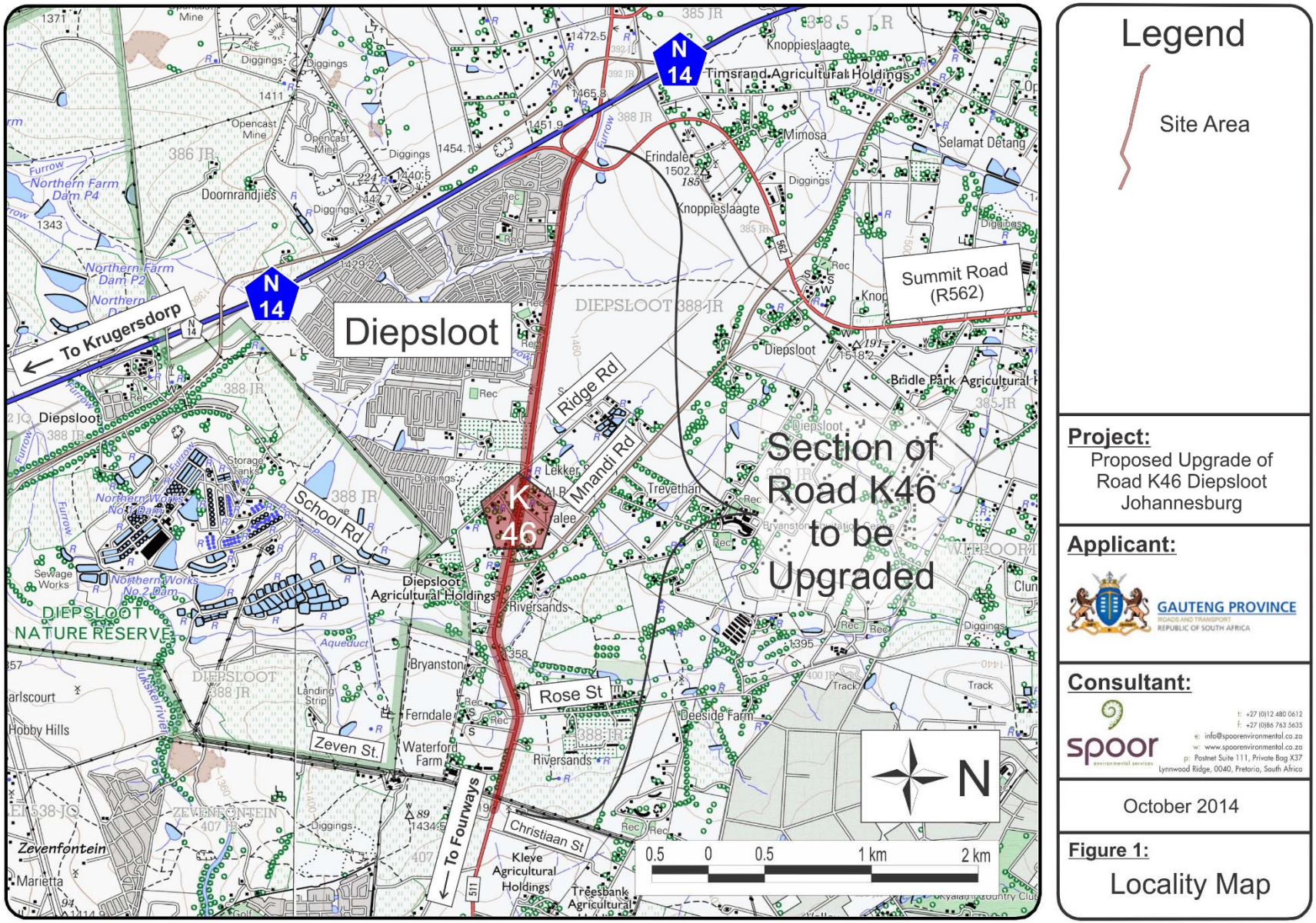
# 2. AIM OF THE EMPr

The aim of the EMPr is to ensure that the planning, assessment, construction and operational phases of the development comply with the relevant environmental legislation, regulations and guidelines. The EMPr furthermore aims to organise and coordinate the proposed environmental management and mitigation measures and to describe these measures in order to prevent, reduce or otherwise manage the potential negative social and environmental impacts associated with the proposed development and to add to the favourable impacts of the project. In brief the EMPr therefore aims to ensure that;

- activities arising as a consequence of the design, construction and operational on the site of the development are managed in a way that reduces or avoids negative social and environmental impacts and to enhance its positive effects,
- impacted environments are restored according to the recommendations of the EMPr,
- efficient information sharing is maintained and a clear understanding exists of all the responsibilities of all the relevant stakeholders,
- the necessary precautions are taken against damages and claims that occur as a result of the implementation of the development in a timeous fashion,
- accurate records are kept of the progress of the development during its various stages as well as of the ongoing monitoring of all its associated social and environmental impacts
- timeous completion occurs of all the implementation activities on account of generally sound management.

# 3. EMPr CONTEXT

This EMPr fits into the overall planning, implementation and operation of the proposed K46 Phase II Upgrade development and should be implemented by the Applicant. A copy of the EMPr should always be available on site. All contractors and sub-contractors must be well-informed of the EMPr and its contents.




Legend

Site Area

**Project:**
Proposed Upgrade of Road K46 Diepsloot Johannesburg

**Applicant:**
GAUTENG PROVINCE
ROADS AND TRANSPORT
REPUBLIC OF SOUTH AFRICA

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October 2014

**Figure 1:**
Locality Map

**Figure 1: Locality**

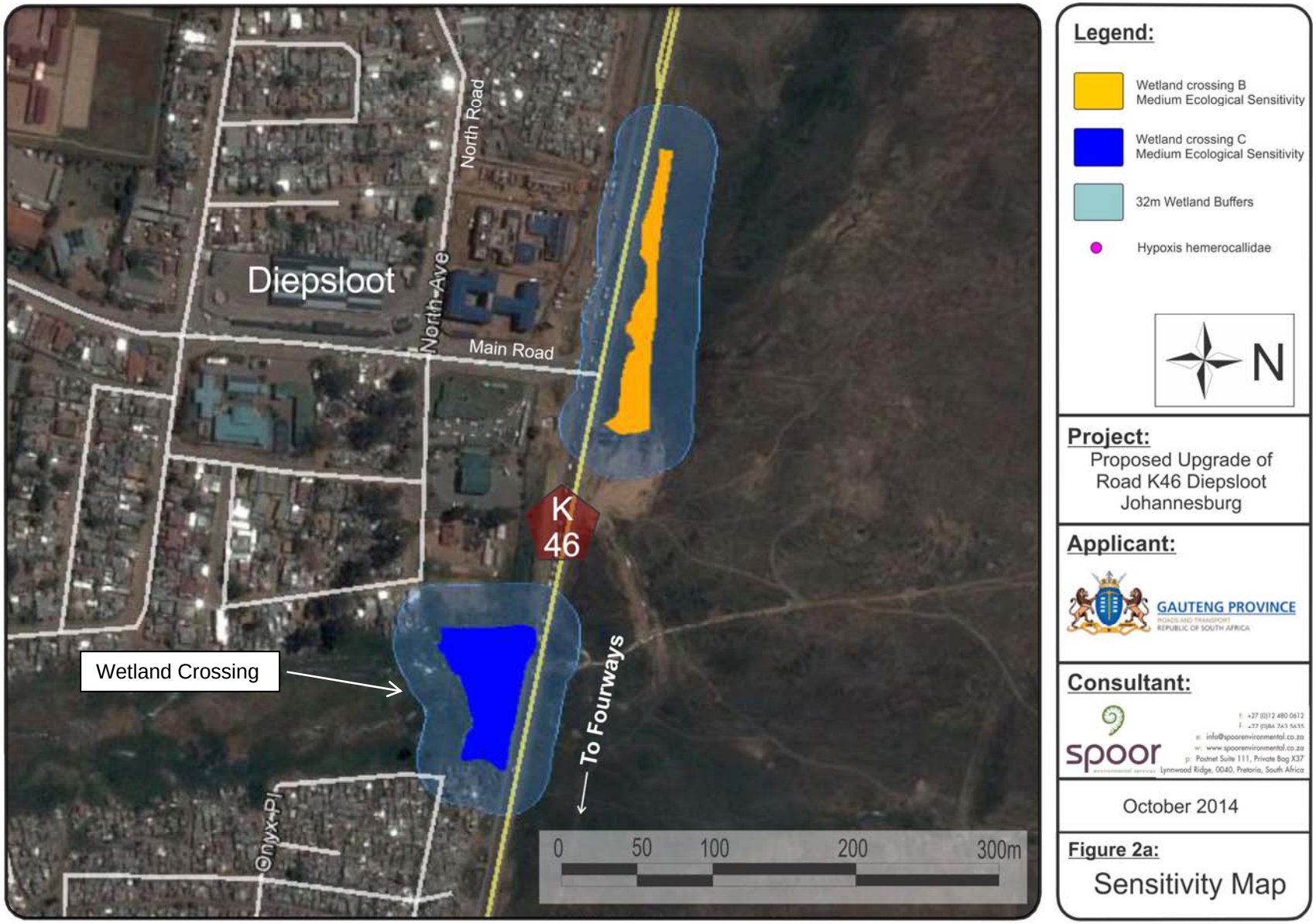


**Figure 2: Wetland Crossing**

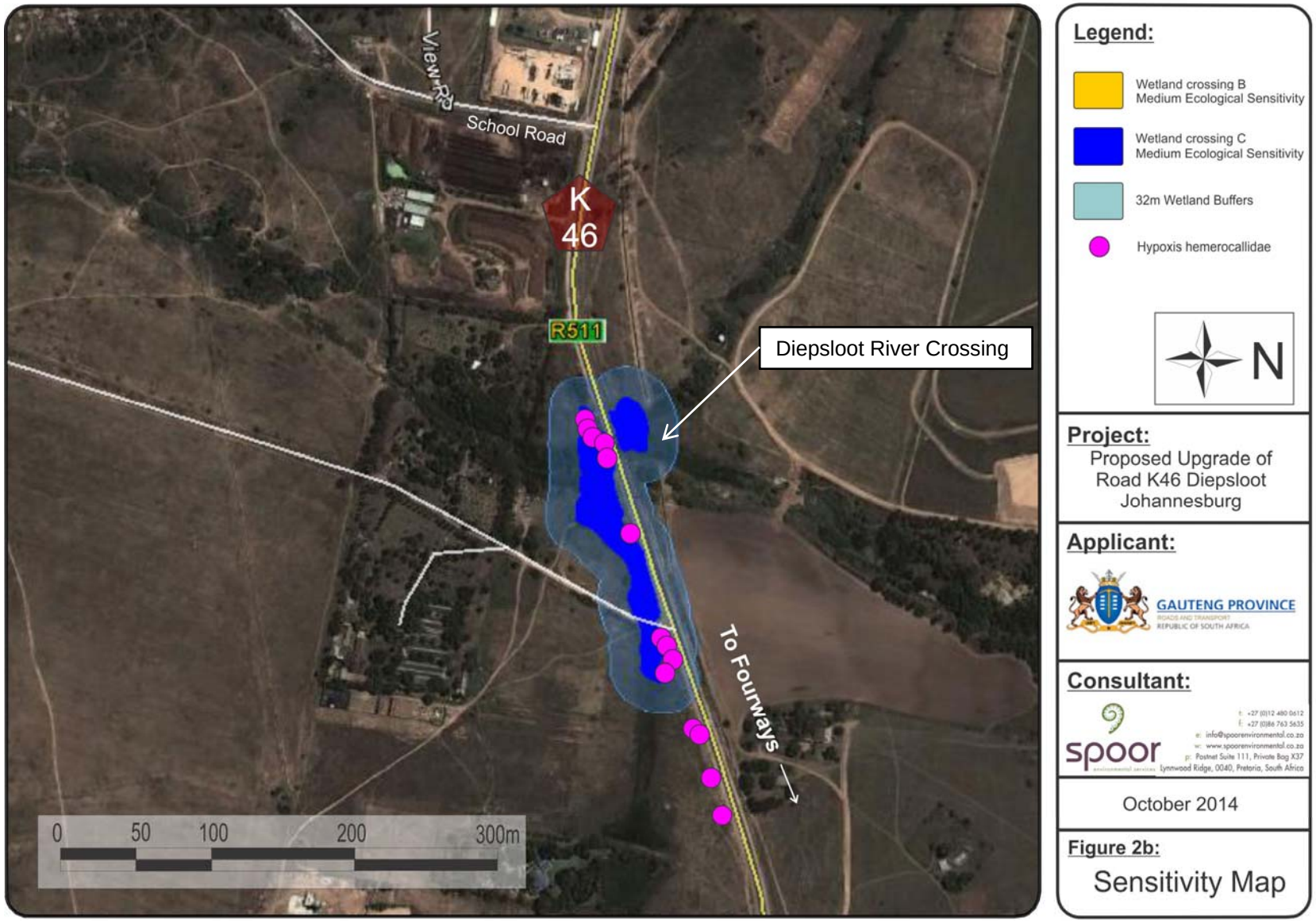


**Figure 3: Diepsloot River Crossing**

# 4. PROJECT DESCRIPTION

## 4.1 Locality

The project entails the second phase of the upgrade of the existing K46 (R511/ William Nicol road between the proposed PVW5 (Zeven Road Area) in the south and the N14 interchange (Summit road) in the north. The proposed new infrastructure will consist of the following aspects;

### 4.1.1 Road Design Considerations

A traffic analysis of the K46 William Nicol Drive corridor determined the most appropriate and cost effective road design to accommodate the anticipated traffic flows (15-20 years) as well as the most efficient interchange layout of William Nicol and the new planned east-west freeway (PWV5). The full extent of new developments (Steyn City, Century Riversands, Tanganani, Cradle City at Lanseria and Northern Farms developments), the anticipated 2030 Regional Road Network and Gauteng Province Planning Department was taken into account.

### 4.1.2 Road Design

a) Carriage way

Road K46 will be upgraded from the existing single lane in both directions to a duel carriage way (two to three lanes in each direction) with a road reserve of 62 metres. The proposed upgrade will extend over a distance of 6-7 kilometres. The upgrade project will include relevant street furniture (e.g. street lighting, litter bins, traffic signage and safety barriers in the required areas), Bus and Taxi pick–up areas with associated structures, traffic signalling, storm water channels and discharge structures.

b) Walkways

Comment during the public participation process revealed the requirement for pedestrian walkways alongside the R511. A 2.5m wide paved walkways on both sides of the alignment were subsequently included into the design.

c) Water crossings

The proposed upgrade of the K46 will include two water crossings over water courses:

i. the first water crossing occurs at 900m from the K46 (R511) – Simmonds crossing,
ii. The second water crossing at 4.5km from there. The second water crossing will cross over the Diepsloot River.

In both cases the crossings of the proposed road over the water courses will consist of a reinforced concrete box culvert structure. A Water Use Licence Application was submitted to the Department of Water Affairs in terms of Section 21(c) and (i) of the National Water Act, 1998, (Act 36 of 1998) for the crossing of the said drainage courses.

d) Access roads to adjacent properties

The Specialist Traffic Engineer explained in the Traffic Impact Assessment that the paramount objective of the proposed K46 Phase II Upgrade project was to increase the regional traffic mobility in the area. In order to achieve this, the Traffic Impact Assessment determined the optimal required road design and infrastructure. The proposed design provides access to adjacent properties via specific signalised intersections provided along the required road safety and design standards. Access road to the adjacent properties includes gravel roads consisting of a 16m road reserve and a 6m wide road surface.

### 4.1.3 Construction Phase

The construction activities associated with the proposed upgrade of the K46 will include the required construction camp including site offices and facilities, temporary sanitation facilities, construction vehicle parking, material holding and laydown areas, etc. Extensive existing construction camps were established for Phase I of the K46 upgrade and these areas will in all likelihood be used for Phase II as well. In addition, the ecological Specialist identified the following areas being influenced by the proposed new infrastructure.

**Table 1: Site Sensitive Areas**

| Crossing | Regional Setting | Landscape Unit | Wetland Type |
|---|---|---|---|
| **Crossing A**<br>**Crossing C**<br>**Crossing D** | **Highveld Ecoregion:** The Proposed linear development falls within the Highveld Ecoregion | **Valley Floor:** The typically gently sloping, lowest surface of a valley | **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it. |
| **Crossing B** | **Highveld Ecoregion:** The Proposed linear development falls within the Highveld Ecoregion | **Valley Floor:** The typically gently sloping, lowest surface of a valley | **Un-Channelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through |

Apart from the principle site sensitivity described above specimens of the African Potato or Star Lily (*Hypoxis hemerocallidea*) were found along the proposed alignment. The Bushman Poison Bulb (*Boophane disticha*) would most probably also occur here. These are Red Data Listed (RDL) species and therefore very sensitive. In terms of faunal species the specialist reported that habitat for the African Grass Owl (*Tyto capensis*) and Giant Bullfrog (*Pyxicephlus adspersus*), exist on site. Of these the African Grass Owl has a *Threatened* rating in terms of its conservation status where the Giant Bullfrog is a RDL species. Although no specimens were encountered this does not mean that they are not present. Special attention will therefore be given in the section dealing with appropriate mitigation measures to ensure that the impact of the proposed road construction on the sensitive landscape features as well as the sensitive faunal and floral species are addressed.

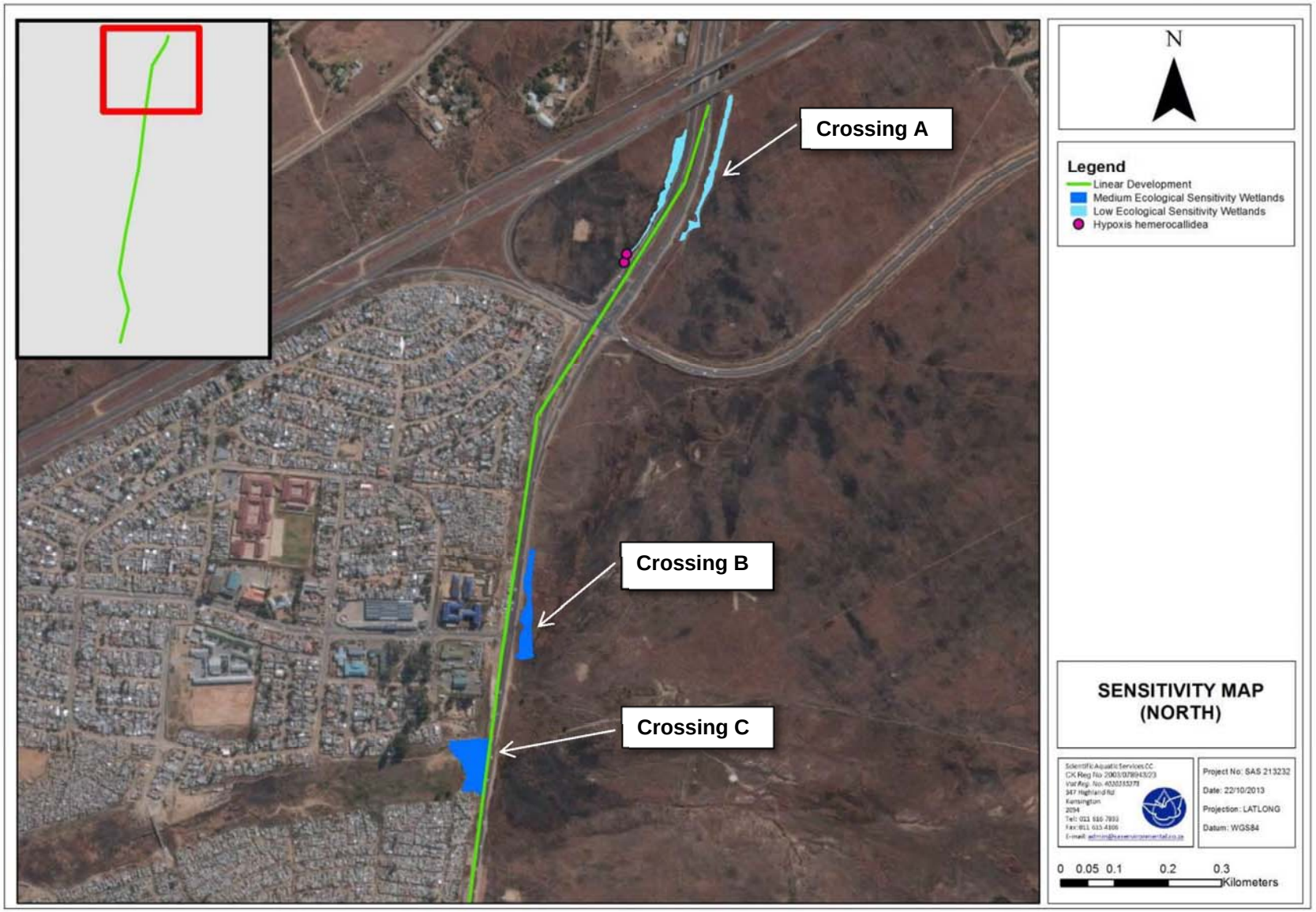


**Figure 2: Wetland Crossings A, B & C**

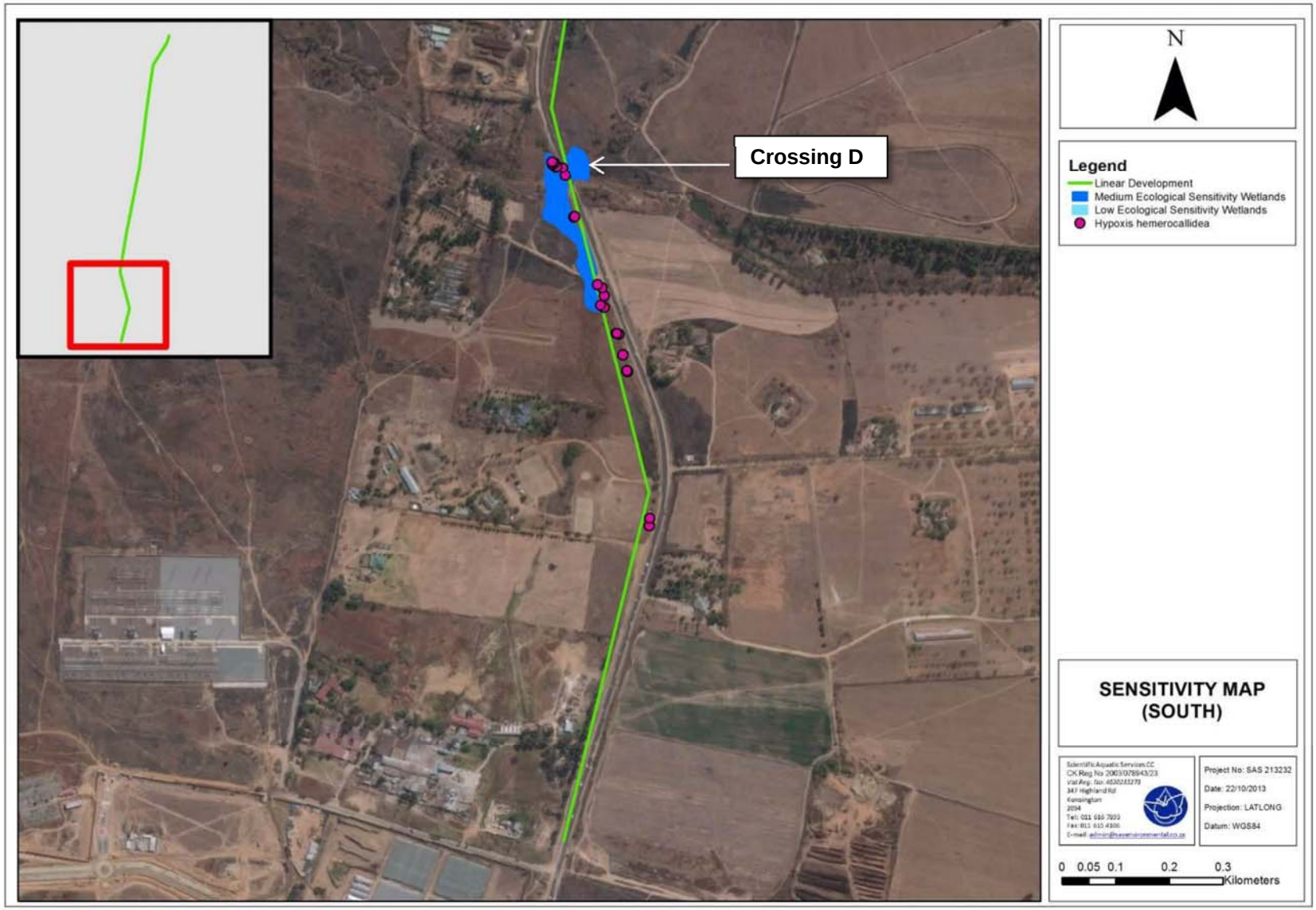


**Figure 3: Wetland Crossing D**

# 5. RECEIVING ENVIRONMENT

The proposed K46 Phase II development site is situated at an average altitude of 1410m above mean sea level. The area receives between 620 and 800mm of rain per annum. Floristically the development site is situated within the Egoli Granite Grassland veldtype which is included in the larger Grassland Biome (Mucina & Rutherford, 2006). Although this veld type is described as endangered in terms of its conservation status, the proposed road upgrades makes exclusive use of the existing road reserve footprint as well as the margins located on the immediate boundary of the said reserve. The proposed road upgrade will however cross sections of sensitive zones associated with local wetland systems and the Diepsloot system. Although these watercourse systems were found to be in a state described as “Largly Modifed” by the Specialist, all riverine areas are to be treated as sensitive and must be treated in the manner described by the Specialist. See Figure 2 & 3.

In terms of the groundcover the ecological Specialist identified 2 principal habitat units. These consist of the *Riparian* and the *Transformed Vegetation* units. The two wetlands occurring at the far north of the proposed road and near the N14 highway, were deemed to be artificially created due to stormwater run-off from the N14 highway, and as a result, were not included in the assessment. Two wetlands were located slightly further south of the artificial wetland features, within the Diepsloot township area, and one wetland, associated with the Diepsloot River, was identified at the far south of the proposed linear development. These areas are largely transformed and primarily as a result of erosion and sedimentation a well as alien vegetation encroachment and severe pollution. The Transformed Habitat unit constitutes most of the vegetation areas adjacent to the existing road that has been cleared or transformed due to alien proliferation. Evidence of vegetation transformation was encountered with invader and weed species such as *Melia azedarach, Eucalyptus camaldulensis, Acacia mearnsii, Hyparrhenia hirta, Tagetes minuta* and *Solanum mauritianum* dominating the unit. In some areas within the road reserve complete vegetation clearance and bare soil was encountered. (SAS, 2014)

Visual inspections of the study area revealed severe pollution of all the riverine systems apart from several erosion gullies along the current alignment and at the discharge ends of some of the storm water culverts. It is quite evident that serious service delivery difficulties exist in the Diepsloot residential area and this is causing severe environmental impacts especially in the riverine areas. It is believed that these impacts surpass the possible impacts related to the addition of the new infrastructure and the Johannesburg Municipality will need to look into this in terms of the impact it has on the quality of the environment here.

Existing activities and facilities alongside the implicated road consists of traffic infrastructure, overhead lighting and signage. Adjacent land uses consist predominantly of high to medium and low density residential areas with intermitted formal and informal trading areas. The proposed new road and pedestrian infrastructure is situated between a number of new residential nodes and access routes in vicinity and will contribute positively to the road safety for the local community members that need to travel between these areas on a daily basis. It is furthermore believed that the street furniture associated with the proposed walkways will also contribute to the quality of the urban environment in this area and to the quality of life for the local community.

# 6. LEGISLATIVE FRAMEWORK

## 6.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution of the Republic of South Africa is the principal legal source of the Republics' legislative framework, including its environmental law. The Bill of Rights is fundamental to the Constitution of South Africa and in, section 24 of the Act, it is stated that:

Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Given that environmental management is founded partly on the principles of public participation, Section 195 of the Constitution is of primary relevance. This section states that:

(1) Public administration must be governed by the democratic values and principles enshrined in the constitution, including the following principles: (a) (b) (c) (d) (e) Peoples needs must be responded to, and the public must be encouraged to participate in policy making. (f) Public administration must be accountable. (g) Transparency must be fostered by providing the public with timely, accessible and accurate information (Government Gazette, 1996)

## 6.2 Environment Conservation Act (ECA) (Act 73 of 1989)

The primary objective of the ECA is to provide for the effective protection and control of the environment. Subsequent to the promulgation of the Act in 1989, a number of key regulations governing EIA's and identified activities that may be detrimental to the environment have also been promulgated. Section 8 of the Regulations regarding activities identified under section 21(1) of the Environmental Conservation Act (73 of 1989) – General EIA Regulations states that:

> *After a plan of study for the environmental impact assessment has been accepted, the applicant must submit an environmental impact report to the relevant authority, which must contain; (a) A description of each alternative including particulars on (i) The extent and significance of each identified environmental impact; and (ii) The possibility for mitigation of each identified impact. (b) A comparative assessment of all the alternatives; and (c) Appendices containing descriptions of (i) The environment concerned; (ii) The activities to be undertaken; (iii) The public participation process followed, including a list of interested parties and their comments; (iv) Any media coverage given to the proposed activity; and (v) Any other information included in the accepted plan of study.*

## 6.3 National Environmental Management Act (NEMA) (Act No 107 of 1998)

The Act provides for the right to an environment that is not harmful to the health and well-being of South African citizens; the equitable distribution of natural resources, sustainable development, environmental protection and the formulation of environmental management frameworks (Government Gazette, 1998). Section 30 (1, 3 and 4) of NEMA states that:

*(1) (a) ''incident'' means an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed. (b) ''responsible person'' includes any*

*person who; (i) Is responsible for the incident; (ii) Owns any hazardous substance involved in the incident; or (iii) Was in control of any hazardous substance involved in the incident at the time of the incident.*

*(3) The responsible person or, where the incident occurred in the course of that person's employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available (a) the nature of the incident; (b) any risks posed by the incident to public health, safety and property; (c) the toxicity of substances or by-products released by the incident; and (d) any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment to; (i) the Director-General; (ii) the South African Police Services and the relevant fire prevention service; (iii) the relevant provincial head of department or municipality; and (iv) all persons whose health may be affected by the incident.*

## 6.4 National Environmental Management: Biodiversity Act, 2004 (NEM:BA) (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed. In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations),
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity,
- Limit further loss of biodiversity and conserve endangered ecosystems.

## 6.5 National Water Act (NWA) (Act 36 of 1998)

The National Water Act (NWA) identifies 11 consumptive and non-consumptive water uses in terms of section 21 of the act which must be authorised. The authorisation system includes scheduled uses, general authorisations and licences. It allows for the reserve of the specific water resource to be determined an also includes a public involvement process in the establishment of strategies and decision-making and guarantees the right to appeal against such decisions. The reserve calculates how much water and the quality of the water within the water resource in order to meet basic human needs as well the ecological requirements.

Section 27 of the NWA specifies that the following factors regarding water use authorisation be taken in consideration:

- The efficient and beneficial use of water in the public interest,
- the socio-economic impact of the decision on whether or not water use is authorised,
- alignment with the catchment management strategy,
- the impact of the water use and possible resource directed measures,
- investments made by the applicant in relation with the water resource in question.

## 6.6 Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (108 of 1996) and given effect by NEMA and the ECA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations. Thus Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

## 6.7 Additional Sets of Relevant Legislation

Other National Legislation which has implications for environmental control on the site includes:

- Conservation of Agricultural Resources Act (43 of 1983), Regulation of the flow pattern of runoff water, Control of weeds and invader plants;
- National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- Occupational Health and Safety Act (85 of 1993).

# 7. MANAGEMENT STRUCTURE

In order to ensure that the prescribed mitigation, rehabilitation and monitoring measures are effectively and efficiently implemented in all the relevant stages of the development, it is important to assign certain responsibilities to the specific managers thereof. The success of the implementation of the aims of this EMPr will not only depend on whether appropriate mitigation and rehabilitation measures have been adequately identified, but also on the level of commitment of all the responsible individuals to implement the recommendations which are proposed in this document.

## 7.1 Applicant

The party or agent who is or represents the Applicant and who will be implementing the development as the contractual overseer is the Applicant or Implementing Agent. In the case of the K46 Phase II Upgrade Development the Applicant is;

**The Gauteng Department of Roads and Transport (GPDRT)**
Mr K Govender
41 Simmonds Street
Sage Life Building
Marshaltown
Johannesburg
2007

Tel: (011) 355 7050
Fax: (011) 355 7235
E Mail: kumen.govender@gauteng.gov.za

### The Implementing Agent

The Implementing Agent who will be implementing the proposed road upgrade on behalf of the GPDRT is:

**Knight Piésold Consulting Engineers**
Mr G Smit
4 de la Rey Road
Johannesburg
Rivonia 2128

Tel: (011) 806 7111
Fax: (011) 806-7100
E Mail: gsmit@knightpiesold.com

The Applicant/Implementing Agent is responsible for:

- the implementation of the EMPr (from the initiation of the project to the completion of construction) and all the prescribed rehabilitation,
- appointing a project manager (PM) that will represent the developer/implementing agent and who will liaise competently will all the Services, contractors, the local community and the other entities involved.

## 7.2 Environmental Assessment Practitioner (EAP)

The appointed Environmental Assessment Practitioner (EAP) is responsible for:

- ensuring that the EMPr for the proposed road upgrade and pedestrian walkway complies with the relevant environmental legislation and all the conditions of the GDARD,
- liaising with the developer/implementing agent at the onset of the construction phase and for ensuring that he/she is aware of the identified responsibilities and of the environmental issues of the development,
- informing the developer/implementing agent of the need of appointing an environmental control officer (ECO) (See 7.5) and providing advice on the actual appointment.
- 

## 7.3 Resident Engineer (RE) or Project Manager (PM)

The Resident Engineer (RE) also known as the Project Manager (PM) usually fulfils the role of the overall project management of the construction project on behalf of the Applicant/Implementing Agent. The PM can also be appointed directly by the Applicant/Implementing Agent and stand independent of the principal construction Contractor, in which case the principal construction Contractor will appoint his/her own PM. It is therefore the responsibility of the Applicant/Implementing Agent to define the specifics of the appointment of the PM/RE. The RE/PM in conjunction with the ECO (See 7.5) will be responsible for the implementation of the EMPr.

## 7.4 Principal Construction Contractor or Principal Contractor (PC)

In the event that the principal construction Contractor and the PM are represented by the same entity, the PM will be responsible for the appointment of sub-contractors and the implementation of this document. With relevance to the EMPr the PC and/or his/her PM are responsible for:

- appointing a construction foreman to act as representative for the PC and their staff,
- responding timeously to any complaints and commands issued by the ECO or Community Liaison Officer (CLO) (See 7.7),
- recording any paper trails from the developer/implementing agent, ECO, CLO and the PM,
- rehabilitating the site to conditions acceptable to the directives of the EMPr and the reasonable approval of the ECO,
- compliance to any applicable laws and acts specifically those relevant to the project
- conducting site inspections along with the ECO, (See 7.5)

## 7.5 Environmental Control Officer (ECO)

The Applicant/Implementing agent is responsible for employing an environmental control Officer (environmental advisor) or ECO at the start of the construction phase.

The ECO, on behalf of the implementing agent will be responsible for:

- compiling a monitoring and auditing plan to ensure that the environmental management procedures of the EMPr are implemented and are effective,

- ensuring that the Contractors/Sub-contractors and Employees are aware of their environmental impact. (This can be achieved through an environmental awareness-training program conducted at the onset of the construction phase),
- conducting and monitoring site activities, and ensuring that they have the minimal environmental impact,
- recording and issuing spot-fines for any non-compliance with the requirements of the EMPr,
- producing a photographic record of the site before, during and after construction,
- liaising between the developer/implementing agent and the PC (and the relevant appointed sub-contractors) and the local community (via the community liaison officer – see 6.7) with regard to all environmental concerns,
- the ECO in association with the relevant parties will also be responsible for assisting in the resolution of conflicts arising due to the development.

## 7.6 Health and Safety Officer

According to the Occupational Health and Safety Act in terms of the Construction Regulations 85 of 1993 (OHS act), which came into effect on 18 July 2003, a Health and Safety Representative (SHE Rep) must be employed under the Compensation for Occupational Injuries and Diseases Act. (COIDA) (Act No 130 of 1993). The SHE Rep will be responsible for the following:

- Investigate potential hazards and dangerous occurrences and examine the causes of accidents.
- Conduct toolbox talks on a weekly basis to sensitise workers of potential hazards on the construction site.
- Attend monthly Health and Safety (H&S) meeting with management.
- Make sure that the workers adhere to the Health and Safety standards regarding Personal Protective Equipment (PPE) and weather related work conditions.
- Have a Safety file on site with the relevant certificates, minutes of H&S meetings and documentation regarding the toolbox talks according to the COIDA act.

## 7.7 The Community Liaison Officer (CLO)

The CLO must preferably consist of an individual representative of the neighbouring Communities and/or other local interest groups. The CLO is appointed by the PC or PM and is responsible for the communication between the neighbours and all the other representatives of the PC/PM management structure for the total duration of the construction phase of the development. The CLO can also function as the community representative during the Operational phase of the development. He/she will therefore be responsible for liaising between the development management, the surrounding landowners and other affected parties within the community as soon as details become available on how the project will affect them and how it might affect them in the foreseeable future.

## 7.8 The Local Community

It is important to involve the local communities where this is relevant in terms of impacts that the development may have on their activities or facilities. If possible a local community member or group should be identified to which pertinent information can be communicated.

These parties will also have an open channel through the ECO to communicate any issues to the applicant.

## 7.9 In General

All of the abovementioned parties (7.1 – 7.8) are responsible for appointing representatives that are suitably qualified to perform the necessary tasks appointed to them. These representatives must also be able to interact within a professional team in order to facilitate all the relevant activities needed for the successful implementation of the EMPr and the completion of the proposed Road K46 Phase II Upgrade development.

# 8. BIOPHYSICAL, SOCIO-ECONOMIC AND CULTURAL IMPACTS AND THE ASSOCIATED MITIGATION AND REHABILITATION MEASURES

## *BIOPHYSICAL ENVIRONMENT*

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| **Aspect:**<br><br>**Composition of Labour Force**<br><br>**Impacts:**<br><br>➢ Employment of members of the Local Community.<br>➢ Appointment of Local SME's | **Project Phase:**<br><br>➢ Construction and<br>➢ Operational.<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO & CLO.<br><br>**Performance Indicators:**<br><br>➢ Employment opportunities,<br>➢ Skills development. | ➢ Members of the local communities closest to the proposed road upgrade development (Diepsloot) must be employed during the construction and operational phases as far as possible, and the contingent of the local community employed must preferably be equally represented by male and female workers.<br>➢ The Relevant skills development workshops should be conducted at all the applicable levels of the local communities and for every possible activity wherever the construction phase of the development can allow for this.<br>➢ The proposed project must make use of the Maximum extent of local SME's as far as possible. A fixed percentage of work to be allocated to the local SME's must be agreed upon between the stakeholders before the start of the construction phase. The Applicant must create a labour desk and ensure information about the number and nature of jobs are advertised in the local communities. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| **Aspect:**<br><br>**Environmental Awareness**<br><br>**Impacts:**<br><br>➢ Fires.<br>➢ Proper personal conduct.<br>➢ Community safety.<br>➢ Spread of HIV Aids.<br>➢ Pollution.<br>➢ EMPr. | **Project Phase:**<br><br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:**<br><br>➢ Environmentally sensitive and responsible conduct.<br>➢ Community safety. | ➢ Cooking in the construction camps must be performed by electrical or gas stoves in well ventilated areas which are declared safe for this purpose. Designated fire places must be provided for, in the construction camps in safe areas away from flammable materials. No fires may be built outside these areas.<br>➢ Sufficient temporary ablution facilities (1 for every 15 people) in the form of chemical toilets must be provided for all workers during the pre-construction, construction and rehabilitation phases of the development. These ablution facilities must be serviced on a regular basis as per the contractor's schedule that provides them.<br>➢ Conduct Environmental Awareness Workshop(s) to sensitize any and all visitors and workers on the site to the relevant site specific sensitivities (significant habitats, such as the Wetlands and the Diepsloot River) and on how these areas must be handled.<br>➢ The community and school children must be educated about the dangers of storm water and living and playing in flood prone areas. The ward councillors and teachers in the community should be educated to act as peer educators.<br>➢ An AIDS awareness programme must be also form part of the Environmental Awareness Programme.<br>➢ This EMPr must be made available to all employees, construction workers, visitors and maintenance personnel on the site to ensure that they are informed of the appropriate environmentally responsible conduct. A copy must therefore be held at the site offices at all times.<br>➢ This EMPr is drafted in such a manner that this section can be reproduced (photo copied) and handed out to all of the managers and | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | contractors who must use it as a monitoring tool whereby check-ups (weekly or monthly whatever is applicable) can be performed and be added to a final monthly report or project completion report to track the monitoring of the project effectively over the lifetime of the construction phase and the Operational phase of the development.<br>➢ All employees, construction workers, maintenance personnel and the RE or PM must furthermore be made aware of the location of the EMPr document (at the site office) and of their responsibility to adhere to the content thereof. This action can be performed at an Environmental Awareness Workshop at the first appropriate time when the bulk of the contractors and sub-contractors have been appointed.<br>➢ Activities such as littering, informal settlement, loud music and other ill-mannered behaviour will be regarded as unacceptable and it will be the responsibility of the various contractors and other employers to ensure that workers under their supervision conduct themselves appropriately. These actions must be reported to the ECO who will see to the issuing of the relevant fines. See Appendix 1.<br>➢ No damage and/or removal of indigenous plant or animal material for cooking or other purposes will be allowed. See Appendix 1. | | |
| **Aspect:**<br><br>**Start of Construction & Related Activities**<br><br>**Impacts:**<br><br>➢ Site clearance for | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction & Operational<br><br>**Responsible Parties:** | ➢ Local authorities (e.g. the City of Johannesburg Metropolitan Municipality (CoJ), SA Police Services (Diepsloot Station) CoJ EMS, and Traffic department) as well as the surrounding land owners and the relevant ward councillors must be notified of the commencement of the construction activities at least 6 weeks before the actual start of | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| administration structures.<br>➢ Compaction of resident soils by construction vehicles.<br>➢ Possible contamination by fuels and other construction materials.<br>➢ Security.<br>➢ Traffic.<br>➢ Access.<br>➢ Informal traders.<br>➢ Occupational Health and Safety.<br><br>*See Appendix 2_Typical Composition of Construction Camp* | PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:**<br><br>➢ Public awareness of start of construction on site.<br>➢ Safety around the construction site.<br>➢ Design and construction of the construction camps.<br>➢ Responsible environmental management in and around construction camps.<br>➢ Concurrent management of Occupational Health and Safety aspects. | the activities. The contractors must, at the relevant community liaison meeting communicate the dangers of the construction site and stress that the site is specifically out of bounds for small children. Special arrangements must be made for traffic management specifically during the construction phase and the Traffic Section of the Johannesburg Metro Police and the PC that the relevant warnings are communicated to the local community before the commencement of major construction. Points men must be deployed at major intersections to assist in managing traffic flow during construction.<br>➢ A complaints register must be maintained on site.<br>➢ The whole of a construction site should preferably be fenced off during construction. The principal contractor must in addition provide suitably visible signage (visible for both motorists and pedestrians) along all of the major circulation routes and entrances around the site informing people that the site is under construction and private property and that no access is allowed for any unauthorised persons. No casual access may be allowed here.<br>➢ Full documentation (ID, contact details and of next of kin) of all construction personnel must be kept on file at the site office and no unauthorised persons may be allowed on site.<br>➢ The construction phase must be managed by strict management guidelines (EMPr as well as the internal guidelines of the individual contractors) and it will be the responsibility of the relevant contractors to ensure that they themselves and their workers conduct themselves according to the management guidelines laid down.<br>➢ The chosen site for construction camps must not be located closer than 100m horizontally from any drainage courses. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | ➢ Vegetation clearance for the erection of construction camps must be kept to an absolute minimum and must adhere to the footprint no larger than the camps themselves. (refer to Appendix 1)<br>➢ The main site office must be situated within one of these camps (PC or Civils) as well as storage areas for construction vehicles and other construction related equipment. Temporary water and fuel tanks must also be contained in the camp as well as a workshop area.<br>➢ Adequate water, sanitation and solid waste disposal services must be provided or arranged for prior to human habitation on the site. Solid waste should be sorted into categories and those not suited to be dumped in an appropriate waste skip at the temporary facility (E.g. cement and chemicals) must be dumped at a recognised waste disposal facility designed for this purpose. A suitable site must be selected for the waste skip site and this site should only contain materials that do not pose any risk in terms of surface or sub surface environmental contamination (e.g. building rubble). This site must also be suitably rehabilitated after completion of the construction activities.<br>➢ An earth berm or drainage ditch (450mmx450mm) must be constructed around construction camps to prevent runoff onto and from these camps.<br>➢ The batching plant must be positioned away from drainage lines, and measures to ensure that no polluted water enters a natural stream, i.e. more than 100m horizontally from any drainage feature. All runoff from batching areas must be strictly controlled.<br>➢ Cement contaminated water must be collected, stored and disposed of at a site approved by the RE. Appropriate measures for overflow from batching plant, e.g. during heavy rains, must be put in place. The | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| | | batching plant shall be banded with earth berms, sandbags or straw bales to prevent runoff escaping from the site.<br>➢ Waste concrete and cement sludge must be scraped off the site of the batching plant daily and removed to an approved landfill site. (To prevent pollution during the rain). Concrete shall not be mixed directly on the ground. Plastic liners or mixing trays are to be used.<br>➢ Special attention must be given to any temporary fuel tank and its surrounding area. This area should be appropriately designed, in a watertight bunker which is able to hold 110% of the volume of the tank itself. The area should be monitored on a weekly basis to ensure that no fuel is leaking into the local soils.<br>➢ The drainage valve of the bunded area may not be allowed to drain into the surrounding soils but must be pumped into containers to be removed by an Oil recycling company.<br>➢ Should an accidental puncture of a fuel tank occur and the bunded area be breached, an appropriate specialist (e.g. Procon Environmental Technologies (PTY) Ltd. (013) 679 4617/34 or similar) should be contacted immediately for clean-up operations. The top soils and sub soils of the site of the spillage must be completely removed and be disposed of at a fittingly licensed facility by the specialist. The excavation must be filled up to the top with healthy soils. This must be performed directly after a spillage and not only at the final rehabilitation of the construction camp to ensure no leaching of oils and fuels into the sub soils.<br>➢ Containment bunkers must be kept empty at all times to be prepared for any emergency spills.<br>➢ All construction materials must be stored in designated areas that are | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | suitable for the containment of that specific material. (Cement, paints, acidic cleaning agents and bitumen, must be stored in water tight containers within the construction camp). In the event of a spillage the appropriate environmental specialist (e.g. Procon Environmental Technologies (PTY) Ltd (013) 679 4617/34 or similar) must be contacted. The contaminated soil must be removed to a depth at which no sign of the contaminant is visible and replaced with healthy soils.<br>➢ Construction vehicles and equipment must be checked and maintained on a regular basis (weekly) to ensure that no environmental contamination is brought about by oil, fuel or hydraulic fluid leakages.<br>➢ All fuel and lubricant oriented areas (for storage and waste) at the service site (e.g. diesel tanks, workshop shed, and compressor shed) must be constructed with impervious concrete floors and oil and fuel resistant walls, with watertight sumps at the end of the catchment drains of these areas. Sumps must be pumped into suitable containers and removed by an appropriate specialist, to a suitably licensed waste disposal facility.<br>➢ After construction is complete the construction camp must be dismantled and full rehabilitation of the site be done.<br>➢ Compacted soils must be loosened to a depth of 300mm and reseeded with seed of locally occurring indigenous ground covering species. This must occur in all the areas not to be taken up by building structures. All soils in areas contaminated with cement dust, small oil and fuel leakages and other contaminants must be removed to an appropriate depth as per the specific contaminant as prescribed by the ECO. These soils must be replaced with suitably healthy soils (able of harbouring plant and animal life) and be stabilised by contouring the soils | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| | | according to the local site contours, reseeded or re planted with soil stabilising ground covering species indigenous to the local area.<br>➢ Where possible, access roads must be restricted to already degraded areas or make use of existing roads and paths.<br>➢ The orientation of these access roads (new roads) must be parallel to the contours to eliminate erosion as far as possible.<br>➢ Drivers of construction vehicles must be informed to make use of accepted access roads only and not enter into any sensitive areas.<br>➢ Site roads must also be reshaped according to the prevailing contours, scarified, fertilized and re-seeded and re-vegetated with indigenous grasses and vegetation characteristic of the local ecological veld types (where no future construction will occur).<br>➢ Plan for informal traders on the construction site to avoid potential problems on site. Signs prohibiting other hawkers from operating illegally on / adjacent to the site must be erected.<br>➢ Informal traders must be educated about the safety and legal aspects associated with trading next to the new road.<br>➢ A permanent and suitably qualified Occupational Health and Safety Officer must be appointed to manage the relevant health and safety aspects during the proposed upgrade development.<br>➢ Construction workers and staff must be supplied with sufficient protective clothing and other gear (e.g. ear plugs) and must furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer.<br>➢ Also see Recommendations under Geology and Soils. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| **Aspect:**<br><br>**Cutting and blasting**<br><br>**Impacts:**<br><br>➢ Stability of specific cut and fill sites<br>➢ Rubble removal<br>➢ Waste Soils | **Project Phase:**<br><br>➢ Pre-construction<br>➢ Construction<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:**<br><br>➢ Environmentally responsible conduct during cutting and/or blasting operations.<br>➢ Occupational health and safety. | ➢ Specific sites where cut and fill activities is needed must be inspected by qualified engineers and signed off as stable and safe before construction activities can commence here.<br>➢ Topsoil (top 300mm layer minimum) must be removed, prior to any earthmoving activities and stockpiled separately from subsoil material.<br>➢ Where these procedures are used during the construction process, rubble associated with the cut operations (natural and **not building rubble**) must be used in the fill areas where no structural stability is needed. E.g. in front of the structures. Rubble may not be left anywhere on the construction site or be pushed down valleys or drainage ways. Materials and rubble left over must otherwise be reshaped and re-vegetated to resemble the surrounding landscape.<br>➢ Material (**only natural)** from cutting should be used for the shaping of earth berms or for landscaping.<br>➢ Near vertical slopes (1:1 or 1:2) must be stabilised using hard structures following specifications, preferably with a natural look and facilities for plants to grow in. Areas with a 1:3 – 1:6 slopes must be logged or covered with a biodegradable membrane material (e.g. Kaytech Soil Saver). Secured logs must be placed in continuous lines following the contours and spaced appropriately depending on the steepness (aspect) of the slope. These slopes must be seeded with an indigenous grass mix to reduce soil erosion. A maintenance programme must be developed to ensure sufficient coverage of the grassed areas and to detect and rehabilitate eroded areas timeously.<br>➢ Where the excavation work involves the use of explosives, a method statement must be developed in accordance with the applicable | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| | | explosives legislation; The Explosives Act 2003 (Act 15 of 2003) by an appointed person who is competent in the use of explosives for excavation work and the contractor shall ensure that the procedures therein are followed.<br>➢ Where there is a reasonable possibility of damage to power and telephone lines or any other property, the contractor shall suitably adapt his method of blasting and the size of charges and shall use adequate protective measures, such as cover blasting, to limit the risk of damage as far as possible. Specific requirements relating to certain services may be included in the Project Specifications.<br>➢ Vibrations caused by blasting operations must be recorded by one or more blasting seismographs of a type as approved by the Engineer and in positions as described by the specialist blasting consultant.<br>➢ A photographic record shall be kept by the blasting consultant of all properties that may be affected by the blasting operations.<br>➢ The Engineer shall be given 24 hours' notice by the Contractor before each blasting operation is carried out. | | |
| **Aspect:**<br><br>**Climate**<br><br>**Impacts:**<br><br>➢ High rainfall in 24 hours could cause potential storm water related impacts e.g. scouring and | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:** | ➢ Implement a construction/management plan to specify the most appropriate time (preferably May – early September) for any construction activities to commence and to phase the construction phase so as to clear only those areas influenced by the next phase of construction.<br>➢ Special attention must be given to the overall storm water design so as to increase the volume of site-specific storm water absorption thereby | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| erosion.<br>➢ Community safety.<br>➢ Potential water saturated soil conditions.<br>➢ The incidence of frost brought about by the proximity to a river system.<br>➢ Electrical storms.<br>➢ Veld fires.<br>➢ Precautionary measures. | ➢ Storm water management.<br>➢ Community safety.<br>➢ Responsible personal conduct of construction staff.<br>➢ Responsible environmental management practice. | decreasing the volumes and velocities of storm water at the discharge ends of the storm water system.<br>➢ Construction and occupational phase storm water management plans must ensure community safety. The management plan must ensure conditions of slow flow and no ponding. Concentrated discharge must be avoided as far as possible and discharged safely and the end of a local storm water channel.<br>➢ The community and school children must be educated about the dangers of storm water and living and playing in flood prone areas. The ward councillors and teachers in the community should be educated to act as peer educators.<br>➢ Special attention must also be given to the design of the storm water structures at the discharge ends of the storm water system so as not to cause erosion damage here. See Appendix 4.<br>➢ Ensure that the founding structures of all the structures are constructed during a time of stable sub soil conditions and as per engineer's detail.<br>➢ Strict safety management rules must accompany the manifest of the road upgrade development in terms of fire safety. No fires may be allowed outside of designated fireplaces and braai areas. All activities and facilities which has fire related activities must be provided with the appropriate fire distinguishing equipment which must be monitored and serviced by a qualified service operator on a regular basis, according to NHBRC specification. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| **Aspect:**<br><br>**Geology and Soils**<br><br>**Impacts:**<br><br>➢ Loss of topsoil – (essential vegetative substrate);<br>➢ Scouring and erosion;<br>➢ Compressibility and collapse potential of transported and residual soils between founding depth and bedrock;<br>➢ Site drainage – to reduce risk of subsurface material saturation and consequent differential movement;<br><br>➢ Perched water conditions on shallow soils. | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Topsoil conservation.<br>➢ Storm water management.<br>➢ Management of accidental contamination and spills.<br>➢ Responsible environmental management practice. | ➢ Topsoil (top 300mm layer minimum) must be removed prior to any earthmoving activities and stockpiled separately from subsoil material and only at the sites of the construction camps and the footprints of the specific structures to be built. The stockpiled topsoil mounds should not exceed 1,5m in height.<br>➢ Topsoil stripping should occur in a phased manner and only where construction will follow rapidly to avoid long periods of exposure and only during periods of low precipitation to avoid erosion and subsequent siltation of nearby water bodies.<br>➢ Areas where construction has to take place must be clearly demarcated to ensure that only these areas are stripped.<br>➢ Stockpiled topsoil must not be compacted by any vehicle and should be protected against erosion. (E.g. construct a bunded area of sand around the topsoil stockpiles to ensure the containment of the topsoil).<br>➢ Stockpiled topsoil must not be contaminated with oil, diesel, petrol, construction material or rubble or any other foreign matter, which may inhibit its potential to harbour faunal and floral communities after rehabilitation.<br>➢ Stockpiled topsoil must not be used as fill material and should be replaced wherever rehabilitation is needed, after construction.<br>➢ Compressibility and collapse potential of the soils and subsurface material of areas where the walkway and pathway infrastructure are to be constructed should be investigated by a qualified engineer and construction should then commence according to the specialist's prescriptions. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| ➢ Contaminations | | ➢ Special attention should be given to site drainage details. Qualified engineers should inspect paving sections and adequate drainage structures should be designed and constructed to avoid subsurface water saturation and possible structural failure.<br>➢ Erosion control measures should be implemented to prevent siltation and loss of existing and remaining topsoil on site.<br>➢ In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as *Petro-Clean* $^{TM}$ or similar. The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. | | |
| **Aspect:**<br><br>**Hydrology**<br><br>**Impacts:**<br><br>➢ Unstable soil conditions as a result of water saturation.<br>➢ Site drainage<br>➢ Scouring and erosion<br>➢ Siltation of downstream water | **Project Phase:**<br><br>➢ Pre construction,<br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Storm water management.<br>➢ Management of | ➢ Implement a construction/management plan to specify the most appropriate time (preferably May – early September) for construction activities to commence and to phase the construction phase so as to clear only those areas influenced by the next phase of construction and to curb major erosion and loss off topsoil as a result of storm water runoff.<br>➢ Special attention should be given to site drainage details. Qualified engineers should inspect the paving alignments and adequate drainage structures should be designed and constructed to avoid subsurface water saturation and possible structural failure of structures erected here. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| bodies<br>➢ Possible groundwater pollution.<br>➢ Ponding | accidental contamination and spills.<br>➢ Responsible environmental management practice. | ➢ When excavations are being done, potential collapsible soil must be pointed out by the engineering and the necessary precautions taken.<br>➢ Storm water drainage structures must be designed by qualified engineers and in a way that disposes of the site storm water in a safe matter, which is not harmful to the surrounding environment in any way.<br>➢ Sufficient numbers of temporary chemical toilets (1 per 15 people) must be installed by the PC for the time of the construction activity and before the permanent sewer system is installed and in an approved working order.<br>➢ Storm water runoff must be channelled from open areas with retention structures (Gabion and Reno Mattresses) to any outlets if applicable. This must be done without compromising the conditions of the sub soil stability. Storm water outlets discharging storm water into the surrounding areas must contain energy dissipating structures that will curb erosion at this outlet into the river effectively.<br>➢ Straw bales should be placed and adequately secured on all downhill locations where erosion may occur to prevent washouts and to retain siltation and topsoil from the site. A supply of straw bales must be kept on site for this purpose.<br>➢ Where ponding occurs these areas must be pumped out or drained to ensure that no ponding occurs that may cause dangerous Operational health and safety conditions especially to the local community's children. These conditions must also be communicated to the community via the CLO and it must be stressed that children especially must stay away from the construction site. See Appendix 4. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| **Aspect:**<br><br>**Vegetation and Animal Life**<br><br>**Impacts:**<br><br>➢ Removal of vegetation and animal habitat as a result of construction activity.<br>➢ Red Data listed species.<br>➢ Diepsloot River.<br>➢ Site specific management plans.<br>➢ Removal of Alien invasive plant species. | **Project Phase:**<br><br>➢ Pre-construction<br>➢ construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicator:**<br><br>➢ Protection of indigenous vegetation.<br>➢ Relocation of sensitive species on site.<br>➢ Management of alien invasive species.<br>➢ Environmental Awareness Training. | ➢ All of the significant indigenous trees and other indigenous vegetation which fall within the areas to be developed if any must be retained or transplanted under the supervision of a specialist. Special attention must be given to ensure that the vegetation in these areas are not disturbed for any purposes i.e. firewood.<br>➢ Any significant indigenous plant specimens (e.g. trees of 1,5m high with a trunk thicker than 150mm and vegetation clusters) that will come into harm's way must be transplanted, (if feasible from a transplantable point of view and to a similar suitable natural area of the site or in a temporary nursery (this can happen at a safe site near the construction camp) and be replanted in the natural areas of the site or be used in the rehabilitation or landscaping of the site during the post construction period.<br>➢ (*Hypoxis hemerocallidea*) Star Lily and Bushman Poison Bulb (*Boophane disticha*) are Red Data Listed (RDL) species identified by the biodiversity specialist to occur along the construction area. In terms of faunal species the Specialist reported that habitat for the African Grass Owl (*Tyto capensis*) and Giant Bullfrog (*Pyxicephlus adspersus*), also exist on site. Prior to ground breaking a biodiversity Specialist must be appointed to perform a walkthrough along the alignment and especially in the sensitive areas and identified habitat areas and clear the area of any sensitive faunal or floral species. Any species found must be relocated to suitable areas along a relocation plan. The Biodiversity Rescue and Relocation Unit of the GDARD must be contacted in this regard.<br>➢ The presence of these species must be communicated during the | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | environmental awareness training as well as the appropriate procedure to follow when these species are encountered by construction staff. Posters disclosing identifiable pictures of these species must be displayed at a suitable location at the construction camp during the construction period.<br>➢ Only indigenous vegetation must be planted during the operational phase to increase the biodiversity of the site and effort should be given to retain the natural character of the site as far as possible.<br>➢ Any small game or other bird, reptile or amphibian specie that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed in a suitable container. The relevant GDARD or closest SPCA must then be contacted to come and remove the animal. This Conservation Department or SPCA will then bear the responsibility to relocate the specie to a suitable habitat.<br>➢ Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the proposed Diepsloot route. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled.<br>➢ Removal of the alien and weed species encountered along the alignment must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational and rehabilitation/ maintenance phases. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | ➢ Species specific and area specific eradication recommendations:<br>• *Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used.*<br>• *Footprint areas should be kept as small as possible when removing alien plant species.*<br>➢ No vehicles should be allowed to drive through designated sensitive areas unnecessarily during the eradication of alien and weed species. | | |
| **Aspect:**<br><br>**Sensitive Sites**<br><br>**Impacts:**<br><br>➢ Construction in wetland areas.<br>➢ Wetlands as depicted in figures 2 & 3.<br>➢ The Diepsloot River<br>➢ Sensitive species | **Project Phase:**<br><br>➢ Pre-construction<br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM & ECO<br><br>**Performance Indicators:**<br><br>➢ Sensitive construction methodologies in wetland areas.<br>➢ Avoidance of identified sensitive areas on site.<br>➢ COLTO Standard Specifications for | ➢ Sensitive areas as indicated in the sensitivity map (Figure 2&3) must be set out on a plan which must be permanently displayed at the site offices of the operational phase site manager and the construction contractor's offices.<br>➢ A reasonable buffer (5m) should be created around this area and must be fenced off to ensure no access into these areas during construction and routine operations apart from the road construction itself. These areas are to be regularly checked by the ECO.<br>➢ The Wetland Specialist identified area where the road alignment will need to cross wetland areas. In terms of these crossings the Specialist made the following recommendations that would need to be followed:<br>1. The design of such culverts / bridges should allow for wetland soil conditions to be maintained both upstream and downstream of the crossing to such a degree that wetland vegetation community structures upstream and downstream of the crossing are maintained. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | Road and Bridge Works.<br>➢ SANRAL Drainage Manual Specifications.<br>➢ Relocation of sensitive species on site.<br>➢ Responsible personal conduct by construction staff.<br>➢ Management of invasive alien vegetation.<br>➢ Storm water management. | 2. The design of such culverts and/or bridges should ensure that the permanent wetland zone should have inundated soil conditions throughout the year extending to the soil surface;<br>3. The design of such culverts and/or bridges should ensure that the seasonal wetland zone should have water-logged soils within 300mm of the soil surface at all times;<br>4. Temporary wetland zone areas should have waterlogged soil conditions occurring to within 300m of the land surface during the summer season.<br>➢ In terms of the above it is further recommended that the relevant standard and specifications in terms of the COLTO Standard Specifications for Road and Bridge Works for State Authorities as well as the SANRAL Drainage Manual be implemented in the design of the road crossings in the wetland areas.<br>➢ In the event that any sensitive or red data species be encountered on site (see above section), the ECO must be contacted (during the construction phase) and relevant the GDARD official or closest SPCA must be notified. The ECO or GDARD or SPCA must then be contacted to remove and relocate the specie found. The specie must be relocated by the specialist to where suitable habitat for the specie exists. The relevant fines must be incurred when these areas or mitigation measures are breached. See Appendix 1.<br>➢ No trapping or other method of catching of any animal or bird species may be performed by any party on the construction or operations site or by any person during the operational phase of the development. If these species become trapped in the foundation trenches or other construction or operational related circumstance, it must be reported to | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | the ECO or Operational Phase Site Manager who must in turn report it to the GDARD or closest SPCA.<br>➢ No dumping of any form is permitted in the drainage area or its surrounds, any non-compliance must be reported immediately. It is the responsibility of the relevant contractor or site manager to inform and supervise their employees.<br>➢ No damage and/ or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed. (See Appendix 1)<br>➢ A property alien eradication and rehabilitation plan must be drafted with the aid of a specialist.<br>➢ Any storm water outlets discharging storm water into the drainage ways must contain energy dissipating structures that will curb erosion at this outlet effectively.<br>➢ The storm water outlet should be constructed according to an approved design for grass species can re-vegetate the proposed gabion blocks speedily. | | |
| **Aspect**<br><br>**Waste Management**<br><br>**Impacts:**<br><br>➢ Waste Management Plan<br>➢ Recycling | **Project Phase:**<br><br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO | ➢ Prepare a Waste Management Plan for the construction site and offices during the construction phase and ensure the provision of dustbins at regular distances (as per CoJ specification) along the routes during the operational phase of the alignment.<br>➢ All construction related areas and roads should be cleared of any construction waste and should be swept clean as to avoid the waste from entering the storm water systems. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| ➢ Storage<br>➢ Cleaning<br>➢ Disposal<br>➢ Waste Removal<br>➢ Record Keeping | **Performance Indicators:**<br>➢ Construction and Operational Waste Management Plan.<br>➢ Closure and Rehabilitation of construction site and construction site camps on completion of construction phase.<br>➢ Waste re-use, recycling and disposal record keeping. | ➢ All solid waste must be removed and transported to an approved registered landfilled site on a weekly basis.<br>➢ On completion of works, the contractor shall clear away and remove from the site all construction paint, surplus material, foundations, plumbing and other fixtures of every kind. Areas thus cleared shall be graded and scarified to restore the ground as near as possible to its original profile.<br>➢ Keep monthly records of waste reuse, recycling and disposal for future reference. Provide information to ECO.<br>➢ Waste must be sorted into the various categories (glass, paper, metals and plastics) and the relevant local recycling contractors should be contacted to remove this waste on a weekly basis.<br>➢ The contractors must supply the principle construction Contractor with a monthly report indicating the types and volumes of waste removed from site. | | |
| **Aspect**<br>**Fuel Management**<br>**Impacts:**<br>➢ Storage<br>➢ Re-Fuelling<br>➢ Drip trays and Spill Kits<br>➢ Notification<br>➢ Rehabilitation | **Project Phase:**<br>➢ Construction<br>➢ Operational<br>**Responsible Parties:**<br>PC, RE, PM, & ECO<br>**Performance Indicators:**<br>➢ Management of fuel related areas. | ➢ Re-fuelling must take place in the designated area with sufficient surface sealing such as a concrete liner to prevent spillage and soil contamination. See Appendix 1.<br>➢ Drip trays (min 10cm deep) must be placed under all vehicles awaiting maintenance, suspected of having a mechanical problem that can lead to a significant leakage, that is decommissioned and awaiting removal or that will remain or the parking area for more than one week.<br>➢ Spill kits must be available in all vehicles that transport hydrocarbons for dispensing to other vehicles on the site. The dispensing devices | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | ➢ Spill management. | (pump heads) must be compatible with the vehicles to which they are dispensing. In addition the dispensing devices must be fitted with the necessary valves/ apparatus that will ensure that the nozzles do not drip fuel after pumping has stopped.<br>➢ The whole of the site where vehicles are operated must undergo routine weekly inspections for any spillages, and these areas must be rehabilitated accordingly.<br>➢ Applicable provincial and local government departments, local municipalities and adjacent landowners must be notified within 24 hours of a spillage or leak.<br>➢ In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as *Petro-Clean* ™ The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. | | |
| **Aspect:**<br><br>**Vehicle Maintenance**<br><br>**Impacts:**<br><br>➢ Design<br>➢ Maintenance area<br>➢ Equipment<br>➢ Machinery | **Project Phase:**<br><br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Sustainable vehicle | ➢ Vehicle maintenance may only be performed if in a sealed off area with an oil impenetrable floor. In the case that the PC cannot supply such a facility on site, all vehicles and machinery must be services and maintained off site. Vehicle maintenance yards and secured storage areas will be established as far as is practicable, outside any 1:100 year flood lines and buffer areas as determined by the storm water management plan. The maintenance yard should be indicated on the | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | management for optimal use. | layout plan of the site.<br>➢ The maintenance of vehicles and equipment used for any purpose during any phase must take place only in the maintenance yard.<br>➢ Any breakdown other than that in the maintenance area of the site requires the presence of a spill treatment team and equipment. This team must prevent and mitigate any spills that occur in this situation.<br>➢ Equipment used in the construction and operational phases must be adequately maintained in order not to spill oil, diesel, fuel, or hydraulic fluid during operations.<br>➢ Machinery or equipment used on the site must not constitute a pollution hazard in respect of the above substances. The main contractor, site manager or ECO shall order such equipment to be repaired or withdrawn from use if he or she considers the equipment or machinery to be polluting and irreparable. | | |
| **Aspect:**<br><br>**General Rehabilitation Measures**<br><br>**Impacts:**<br><br>➢ Relevant phases of the activity<br>➢ Contamination<br>➢ Rehabilitation measures | **Project Phase:**<br><br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Removal and | ➢ Rehabilitation should be implemented immediately after construction activities and should aim to prevent erosion and aid the return of natural, endemic and indigenous vegetation cover.<br>➢ After any construction activities are complete, the services camp must be taken down and full rehabilitation of the temporary construction site be done. Compacted soils must be loosened to a depth of 300mm re-compacted lightly (via turf roller) and reseeded with seed of locally occurring indigenous ground covering species.<br>➢ All soils contaminated with cement dust, small oil and fuel leakages and other contaminants must be removed to an appropriate depth as | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | rehabilitation of construction camps.<br>➢ Rehabilitation of contaminated areas.<br>➢ Establishment of sufficient vegetation layer on all barren soil areas. | per the specific contaminant and as prescribed by the ECO and be taken to an approved landfill site. These soils must be replaced with healthy soils (able of harbouring plant and animal life) and be stabilised by contouring the soils according to the local site landform.<br>➢ Site roads used during construction must also be reshaped according to the prevailing landform, scarified, fertilized and re-seeded and re-vegetated with indigenous grasses and vegetation characteristic of the local ecological veld types.<br>➢ After construction, the PC/PM/operational phase Site Manager must ensure that the site is clean and void of any soils, construction rubble or any other construction related materials.<br>➢ All barren sections of the finished construction area around the development must be wetted and stabilised to form a good medium for planting. These areas must then be reseeded with indigenous species resembling the existing specie mix. The area must be reseeded at a rate of 5kg/ha with an indigenous seed mix appropriate for the local area.<br>➢ The whole of the construction area must be cleared of any loose laying mounds of soil or other construction materials and litter. The ECO and the PC/PM must organize a final site inspection to see if this measure is in place before the site is signed off as finished.<br>➢ Cognisance must be taken of all of the mitigation and rehabilitation measures in the site specific EMPr and must be read in conjunction with this rehabilitation plan. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| ***SOCIO-ECONOMIC ENVIRONMENT*** | | | | |
| **Aspect:**<br><br>**Road Proclamation:**<br><br>**Impacts:**<br><br>➢ Loss of landowner autonomy | **Project Phase:**<br><br>➢ Pre-construction<br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO, & CLO<br><br>**Performance Indicators:**<br><br>➢ Adequate Applicant/PC/RE communications. | ➢ The owner of each of the affected properties must be contacted individually to ensure that these owners appreciate the implications of the land proclamation and expropriation process on their properties.<br>➢ The Applicant must provide the contact detail (name & contact detail) of the person who will manage the expropriation process from the side of the Applicant and where the relevant landowners can contact the Applicant. | | |
| **Aspect:**<br><br>**Livelihoods:**<br><br>**Impacts:**<br><br>➢ Impacts on landowner livelihoods | **Project Phase:**<br><br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO, & CLO<br><br>**Performance Indicators:**<br><br>➢ Adequate | ➢ Where a landowner depends on his property to earn a living, and the impact of the K46 road proclamation is such that he cannot continue to do so due to the presence of road, this landowner must be compensated to the extent where he can relocate to another area where he can engage in similar livelihood activities and can generate a similar or better income. Compensation will be determined as per section 28 Gauteng Transport Infrastructure Act, 2001 (Act 8 of 2001).<br>➢ Impacts on the livelihood of such landowners must be investigated in a study that assesses the economic and livelihoods impacts on each property where livelihoods are affected. This process can be performed | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | Applicant/PC/RE communications. | in parallel to the road proclamation, expropriation and compensation process and outside of the Basic Assessment study. | | |
| **Aspect:**<br><br>**Access:**<br><br>**Impacts:**<br><br>➢ Temporary lack of access to residential properties.<br>➢ Temporary lack of access to commercial activities. | **Project Phase:**<br><br>➢ Construction<br>➢ Operation<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO, & CLO<br><br>**Performance Indicators:**<br><br>➢ Stakeholder communication.<br>➢ Sufficient access to residential property.<br>➢ Sufficient access to commercial activities. | ➢ Surrounding landowners, commercial activities and other relevant stakeholders (Service providers) must be notified well in advance (4 weeks) in terms of any services interruptions which might affect them.<br>➢ The relevant land owners and business owners along the K46 must retain legal access to their properties. Where new access needs to be provided for a landowner or business owner the Applicant must either compensate the landowner for this infrastructure, or appoint and pay the PC to perform the required construction on their behalf.<br>➢ Where new access needs to be provided, the Applicant must discuss the most feasible location of this access with the landowner in line with accepted traffic safety standards and the property specific access authorisations.<br>➢ New access roads to properties should be maintained by the relevant authority and should represent high quality gravel roads. | | |
| **Aspect:**<br><br>**Disruption of Services:**<br><br>**Impacts:**<br><br>➢ Temporary disruptions in | **Project Phase:**<br><br>➢ Construction<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO, & CLO<br><br>**Performance Indicators:** | ➢ Surrounding landowners and other relevant stakeholders (Service providers) must be notified well in advance (6 weeks) in terms of any services interruptions which might affect them.<br>➢ Business ventures specifically and also alongside road K46 must likewise be notified well in advance of the estimated start of the construction activities. | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| services. | ➢ Sufficient notifications to surrounding landowners and relevant stakeholders in terms of possible disruption of services.<br>➢ Maintenance of Complaints Register.<br>➢ Wayleave authorisations. | ➢ Services on properties must be relocated before construction commences and is finalised. The Applicant should compile an Asset and Infrastructure Baseline report (including photographic evidence) of all services and infrastructure in the servitude. This could be used in the negotiation process and by the valuators to determine the compensation amounts.<br>➢ A complaints register must be maintained on site. Complaints must be discussed at each of the construction Technical Meetings and specific responsibility must be assigned to manage each complained. The responsible parties must report back at the following Technical Meeting as to the progress in terms of the management of each compliant up until it is resolved. The relevant penalties must be levied in terms of non-compliance to this management measure.<br>➢ Business owners along the route must be provided with the contact detail of the relevant agent of the PC where access related issues can be reported and resolved speedily<br>➢ The PC and the PM must ensure that they are in contact with the relevant services providers where services will need to me moved and that the required wayleave authorisations are in place before the services are moved. | | |
| **Aspect:**<br><br>**Business Sustainability:**<br><br>**Impacts:** | **Project Phase:**<br><br>➢ Construction<br>➢ Operation<br><br>**Responsible Parties:** | ➢ Where businesses need to scale down on their legal activities or relocate because of the impact of the proposed road as a result of an aspect such as the decrease in the size of their property to accommodate the road, this should be considered in the compensation packages offered to them. These business activities | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| ➢ Loss of business sustainability.<br>➢ Loss of formal business opportunities,<br>➢ Loss of informal business opportunities. | PC, RE, PM, ECO, & CLO<br><br>**Performance Indicators:**<br><br>➢ Stakeholder communication.<br>➢ Sustained formal and informal business operations.<br>➢ Sufficient access to formal and informal commercial activities. | must be compensated to the extent where it can relocate to another area where it can engage in similar business activities and can generate a similar income. Compensation will be determined as per section 28 Gauteng Transport Infrastructure Act, 2001 (Act 8 of 2001).<br>➢ Where irreconcilable differences occur during the proclamation, expropriation and compensation process, a separate study assessing the economic and livelihood impacts on each such business property must be conducted. The study can be conducted outside of the Basic Assessment process and should include a legal review of rights and consider reasonable steps that were taken to ensure that people were aware of the road proclamation. This can be done in parallel with the expropriation process with input from the valuators.<br>➢ Provision for informal businesses must be made in places where there is a concentration of people, for example at the pick-up and drop-off points, or at the pedestrian crossings. Priority must be placed of traffic safety and mobility in terms of this infrastructure.<br>➢ The Applicant and the relevant local ward Councillors must consult with the informal traders to ensure that they understand their needs. If there are any direct financial losses that can be related back to the project, the project should compensate the businesses for those losses, given it can be substantiated with the necessary evidence.<br>➢ A complaints register must be maintained on site. Complaints must be discussed at each of the construction Technical Meetings and specific responsibility must be assigned to manage each complained. The responsible parties must report back at the following Technical Meeting as to the progress in terms of the management of each compliant up until it is resolved. The relevant penalties must be levied | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | in terms of non-compliance to this management measure. | | |
| **Aspect:**<br><br>**Visual Environment**<br><br>**Impacts:**<br><br>➢ Construction related activities.<br>➢ Final visual outlook of the development. | **Project Phase:**<br><br>➢ Pre-construction<br>➢ Construction<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Maintenance of construction camps and site during construction phase.<br>➢ Screening of negative visual aspects of the road construction with vegetation. | ➢ Negative impacts related to the construction phase of the development will only last for the duration of the construction phase of the development and will thus not be permanent. The PC and subcontractors must see to the overall tidiness of the construction area and that construction vehicles, materials and personnel stay within the construction camps after hours, over weekends and on public holidays. For the relevant proposed fines see Appendix 1.<br>➢ Indigenous vegetation must be used to screen negative visual aspects of structures. Screening must however not be obtrusive to the natural character of the site.<br>➢ Screening vegetation and landscaping must be planted to ensure that it is applied in a way that compliments the vegetation of the region. | | |
| **Aspect:**<br><br>**Noise:**<br><br>**Impacts:**<br><br>➢ Possible noise | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:** | ➢ The surrounding land owners and all of the registered I&AP's must be notified of the commencement of construction activities well in advance of the actual start of the activities (At least 6 weeks).<br>➢ Structures containing activities that may contribute to undesirable | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| pollution occurring as a result of construction activities.<br>➢ Use of explosives<br>➢ Occupational Health and Safety | PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:**<br>➢ Notification of surrounding landowners pre construction commencement.<br>➢ Maintenance of construction equipment.<br>➢ Proper personal conduct by all construction staff.<br>➢ Compliance with occupational health and safety regulations. | noise levels in the area must be placed and orientated to face away from areas sensitive to noise pollution as far as possible.<br>➢ Noisy activities related to the construction phase of the development (e.g. vehicles, compressors, workers) must be kept to the necessary minimum. Construction activities must also be restricted to between 08:00 in the mornings and 05:00 in the evening and not on any weekend or public holidays. This must be monitored by the ECO and fines must be levied for non-compliance. (See Appendix 1).<br>➢ Noise barriers such as solid walls near must be erected near sensitive receptors such as schools, hospitals, old age homes and residences.<br>➢ All employees, construction workers and maintenance personnel must be instructed to be sensitive towards the surrounding land owners. This action can be performed via an Environmental Awareness Workshop at the first appropriate time when the bulk of the contractors and sub-contractors have been appointed. (See Appendix 1)<br>➢ Activities such as loud music and other ill-mannered behaviour must not be allowed. This behaviour will be regarded as unacceptable and it will be the responsibility of the various contractors and other employers to ensure that workers under their supervision conduct themselves appropriately. These actions must be reported to the ECO who will see to the issuing of the relevant fines. (See Appendix 1). Further it is the responsibility of the Body Corporate to implement and inform residents of the noise policy guidelines for the development.<br>➢ Construction vehicles and equipment must be regularly serviced to avoid the noise that these machines may make if in disrepair.<br>➢ Construction workers and staff must be supplied with sufficient protective clothing and other gear (e.g. ear plugs) and must | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
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| | | | YES | NO |
| | | furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer.<br>➢ The contractor shall give the Engineer 24 hours' notice before any blasting operation is carried out.<br>➢ The applicant via the contractor must inform surrounding landowners, the local community and any other registered I&AP at least 24 hours prior to blasting operations in order for them to make the necessary arrangement. | | |
| **Aspect:**<br><br>**Air Quality:**<br><br>**Impacts:**<br><br>➢ Increased dust pollution could occur during construction activities.<br>➢ Generation of dust on site dirt roads.<br>➢ Occupational Health and Safety | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, ECO & CLO<br><br>**Performance Indicators:**<br><br>➢ Sufficient dust suppression regimes during construction and operation.<br>➢ Speed control on gravel roads during construction and operation. | ➢ Dust suppression must be performed according to the seasonal changes and according to the prevailing site-specific circumstances via a dust suppression truck on the site roads, other construction areas and the parking areas.<br>➢ Vegetation along roads and landscaping of the larger development environment will help improve air quality over the long term and must therefore be planted wherever disturbed as far as possible.<br>➢ Site roads and parking areas must furthermore be maintained to remain in a good condition (e.g. roads must be kept from widening so as to keep the exposed area (area influenced by winds) as small as possible.<br>➢ Construction vehicles must maintain low speeds on all site roads (10 – 30 km\h) to reduce dust dispersal during construction.<br>➢ The Johannesburg Roads Agency (JRA) must form part of a local access road management committee to ensure that the gravel access roads are wetted on a regular basis to reduce dust dispersal during dry | | |

| ASPECT & IMPACTS | PROJECT PHASE<br>RESPONSIBLE PARTY<br>PERFORMANCE INDICATOR | MITIGATION AND REHABILITATION MEASURES | COMPLIANT | |
|---|---|---|---|---|
| | | | YES | NO |
| | ➢ Management of gravel access road in conjunction with the JRA. | months.<br>➢ The onsite health and safety manager must ensure that workers are supplied with the correct safety wear and equipment (e.g. dust masks) and that they are informed as to their appropriate use. | | |
| **Aspect:**<br><br>**Archaeological Findings:**<br><br>**Impacts:**<br><br>➢ Possible archaeological findings. | **Project Phase:**<br><br>➢ Pre-construction;<br>➢ Construction and<br>➢ Operational<br><br>**Responsible Parties:**<br><br>PC, RE, PM, & ECO<br><br>**Performance Indicators:**<br><br>➢ Environmental Awareness | ➢ Employees, contractors and construction workers should be informed to report any unusual finds during the construction and operational phases, to the ECO in order to implement the correct procedures according to the South African Heritage Resources Act to conserve these finds appropriately.<br>➢ This impact must be brought forward during the environmental awareness workshops. | | |

**Note:** The following sections of previously compiled documents and addendums must be reviewed in conjunction with this EMPr;

- All recommendations and mitigation measures discussed in the Final BAR of the proposed Upgrade of Road K46 Phase II (SPOOR Environmental Services (PTY) Ltd. October 2014), Ref. No GAUT: 002/13-14/E0171,
- All recommendations and mitigation measures discussed in the specialist Traffic Impact Assessment,
- All recommendations and mitigation measures discussed in the specialist Heritage Impact Assessment,
- All recommendations and mitigation measures discussed in the specialist Geo-Technical Investigations,

- All recommendations and mitigation measures discussed in the Civil Engineering Structures Conceptual Design Report,
- All recommendations and mitigation measures discussed in the specialist Faunal, Floral and Wetland Delineation Assessment,
- All recommendations and mitigation measures discussed in the specialist Social Impact Assessment.

# 9. CONCLUSION

Impacts caused as a result of the construction and operational phases of the proposed upgrade of road K46 development are generally not deemed to be significant. From a biodiversity perspective construction activities will enter the sensitive riverine areas as indicated by the Specialist. These areas are in itself in advanced stages of transformation and degradation but special care must be taken during the construction and operational phases to ensure that these areas are not degraded to a greater extent. Recommendations have also been made on how the quality of the local receiving environment can be managed in a responsible manner in the longer term.

Socio-economically the proposed construction of this section the K46 will have noteworthy impacts. Local ease of access, possible disruption in services, security and general hindrances has been identified as some of these impacts. Current and future development in the area has made it necessary that the road be upgraded though and it is believed that the construction of the road will enhance the socio-economy of the local area in the medium to longer term. Impacts can furthermore be significantly minimised provided that the mitigation and rehabilitation measures included in section 8 of this EMPr are strictly adhered to. corresponding recommendations are made concerning appropriate mitigatory measures.

Finally, the principle benefit of the upgraded road and associated infrastructure would be to the local communities although it will also provide services and amenities to visitors travelling through the area. Although not on a grand scale, the proposed development will affect a range of new employment opportunities, which could provide noteworthy skills development opportunities in the short term, as well as sustained opportunities (maintenance) over the longer term.

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# APPENDIX 1

## Proposed Penalties and Fines Associated with Various Acts of Non-compliance and Miss-conduct.

## PROPOSED PENALTIES AND FINES FOR NON-COMPLIANCE OR MISCONDUCT

This EMPr forms part of the contract agreement between the Client and the Principal contractor and the Site Manager. As such, non-compliance with conditions of the EMPr will amount to a breach of contract. Penalties will be issued directly to the PC/Site Manager by the ECO in the event of non-compliance to the EMPr specifications. The issuing of a penalty will be preceded by a verbal warning by the ECO, as well as strict instruction in at least one monthly ECO report to rectify the situation. The ECO and PC/Site Manager will communicate with regards to realistic time-frames for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPr.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the PC/Site Manager if such actions were in contravention of the specifications of the EMPr will be borne by the PC/Site Manager himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPr cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts listed in table 1 may be adjusted depending on the seriousness of the infringement.

**Category One –** Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities or persons passing through the area.
**Category Two –** Acts of non-compliance that cause minor environmental impact or localised disturbance.
**Category Three –** Acts of non-compliance that affect significant environmental impact extending beyond point source.
**Category Four –** Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

All of the contraventions mentioned in table 1 as well as any other contravention to the EMPr specifications should be measured in terms of one of these 4 categories of non-compliance and penalties or fines should be adjusted accordingly.

**TABLE 1: List of Proposed Fines and Penalties as Applicable to Various Acts of Non-Compliance or Misconduct:**

| ***DESCRIPTION OF NON-COMPLIANCE TO EMPr SPECIFICATION*** | ***SPOT FINES AND PENALTIES THAT COULD BE INCURRED*** |
|---|---|
| Any person, vehicle, plant or other activity related to the contractor's operations that spill over into a "no-go" or sensitive area | R 4 000 |
| Any vehicle driving in excess of specified speed limits | R 1 000 |
| Vehicles being driven, plant or construction materials being stored outside of demarcated areas within the construction site. Unauthorised persons on site. | R 2 000 |
| Persistent, un-repaired oil/fuel leaks from machinery/vehicles. Spillages of oil/fuel at the re-fuelling site. Spillage of hazardous (e.g. Cement, Asphalt, Chemicals) materials on site. Burying of soils containing these spillages. | R 5 000 |
| Litter on site or Dumping/ burying of rubble or waste outside designated location/s. Inadequate provision of waste disposal facilities on site | R 2 000 |
| Illegal Fires on site | R 5 000 |
| Eating / cooking food outside of designated areas. Inadequate site ablution facilities or failure to make use of the site ablution facilities. | R 1 000 |
| Excessive noise and / or dust as a result of site activities | R 2 000 |
| Contractor's operations causing a public nuisance as a result of contravention of EMPr specifications. | R 2 000 |
| Activities in contravention of EMPr that cause water waste or pollution | R 5 000 |
| Poaching/ setting of snares or traps. | R 5 000 |
| Damage to cultural Sites | Up to R 100 000 |
| Erosion as a result of non-compliance – penalty shall be equivalent to the cost of rehabilitation plus 20% | |
| | |

| |
|---|
| Severe oil spills - penalty shall be equivalent to the cost of clean-up operations plus 20% |
| Damage to indigenous vegetation or sensitive environments - penalty shall be equivalent to the cost of rehabilitation plus 20% |
| Penalties for removing or damaging trees that are to be retained |

| Girth of Trunk 1m above ground level | Replacement value per tree |
|---|---|
| 0 – 15 mm | R 100 |
| 16 – 30 mm | R 200 |
| 31 – 50 mm | R 500 |
| 51 – 75 mm | R 1 000 |
| 76 – 100 mm | R 2 500 |
| 101 – 150 mm | R 5 000 |
| 151 – 300 mm | R 10 000 |
| Larger than 300 mm | R 15 000 – R 100 000 |

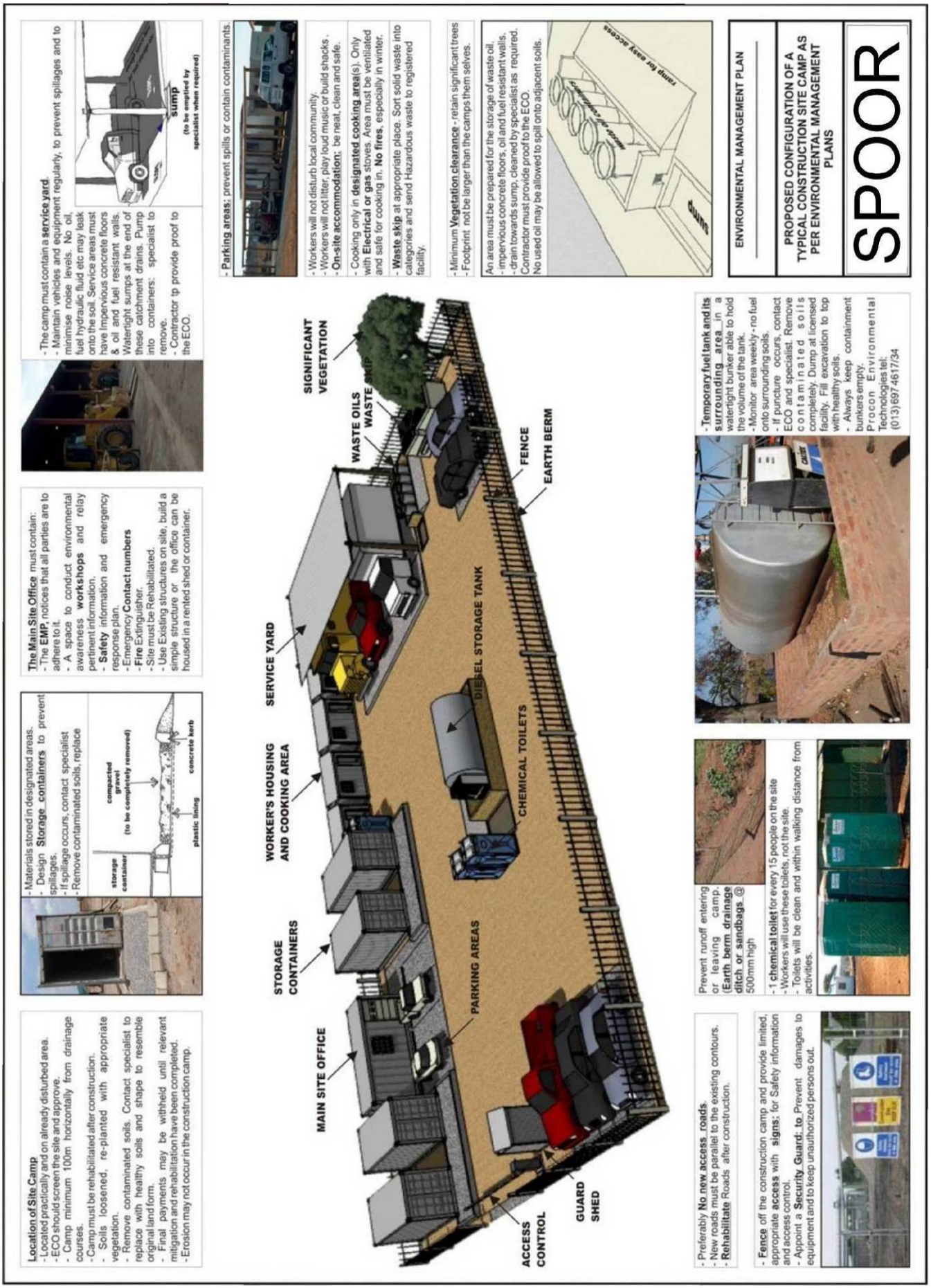
**FOR ANY REPEAT OFFENDERS THE FINE WILL BE DOUBLED AND A THIRD OFFENCE COULD RESULT IN PERMANENT SUSPENSION.**

The following acts and legislation, amongst others, apply and will be enforced and monitored by the ECO;

- Environmental Conservation Act, (Act 73 of 1989)
- National Environmental Management Act, (Act 107 of 1998)
- National Environmental Management: Biodiversity Act, (Act 10 of 2004)
- Water Act, 1998, (Act 36 of 1998)
- National Parks Act, (Act 57 of 1976)
- Lake Areas Development Act, (Act 139 of 1975)
- Mountain Catchment Areas Act, (Act 63 of 1970)
- Forest Act, (Act 122 of 1984)
- Conservation of Agricultural Resources Act, (Act 43 of 1983)
- All Provincial ordinances and regulations as applicable

# APPENDIX 2

# Typical Composition of a Construction Camp


SPOOR
PROPOSED CONFIGURATION OF A TYPICAL CONSTRUCTION SITE CAMP AS PER ENVIRONMENTAL MANAGEMENT PLANS
ENVIRONMENTAL MANAGEMENT PLAN
Location of Site Camp
- Located practically and on already disturbed area.
- ECO should screen the site and approve.
- Camp minimum 100m horizontally from drainage courses.
- Camp must be rehabilitated after construction.
- Soils loosened, re-planted with appropriate vegetation.
- Remove contaminated soils. Contact specialist to replace with healthy soils and shape to resemble original land form.
- Final payments may be withheld until relevant mitigation and rehabilitation have been completed.
- Erosion may not occur in the construction camp.
- Materials stored in designated areas.
- Design Storage containers to prevent spillages.
- If spillage occurs, contact specialist
- Remove contaminated soils, replace
storage container
compacted gravel (to be completely removed)
plastic lining
concrete kerb
The Main Site Office must contain:
- The EMP, notices that all parties are to adhere to it.
- A space to conduct environmental awareness workshops and relay pertinent information.
- Safety information and emergency response plan.
- Emergency Contact numbers
- Fire Extinguisher.
- Site must be Rehabilitated.
- Use Existing structures on site, build a simple structure or the office can be housed in a rented shed or container.
- The camp must contain a service yard.
- Maintain vehicles and equipment regularly, to prevent spillages and to minimise noise levels. No oil, fuel hydraulic fluid etc may leak onto the soil. Service areas must have Impervious concrete floors & oil and fuel resistant walls. Watertight sumps at the end of these catchment drains. Pump into containers: specialist to remove.
- Contractor tp provide proof to the ECO.
sump
(to be emptied by specialist when required)
- Parking areas; prevent spills or contain contaminants.
- Workers will not disturb local community.
- Workers will not litter, play loud music or build shacks.
- On-site accommodation; be neat, clean and safe.
- Cooking only in designated cooking area(s). Only with Electrical or gas stoves. Area must be ventilated and safe for cooking in. No fires, especially in winter.
- Waste skip at appropriate place. Sort solid waste into categories and send Hazardous waste to registered facility.
- Minimum Vegetation clearance - retain significant trees
- Footprint not be larger than the camps them selves.
An area must be prepared for the storage of waste oil.
- impervious concrete floors, oil and fuel resistant walls.
- drain towards sump, cleaned by specialist as required.
Contractor must provide proof to the ECO.
No used oil may be allowed to spill onto adjacent soils.
Temp for easy access
Access off carriageway
drains
- Temporary fuel tank and its surrounding area in a watertight bunker able to hold the volume of the tank.
- Monitor area weekly - no fuel onto surrounding soils.
- If puncture occurs, contact ECO and specialist. Remove contaminated soils completely. Dump at licensed facility. Fill excavation to top with healthy soils.
- Always keep containment bunkers empty.
Procon Environmental Technologies tel: (013) 697 4617/34
Prevent runoff entering or leaving camp. (Earth berm drainage ditch or sandbags @ 500mm high
- 1 chemical toilet for every 15 people on the site
- Workers will use these toilets, not the site.
- Toilets will be clean and within walking distance from activities.
- Preferably No new access roads.
- New roads must be parallel to the existing contours.
- Rehabilitate Roads after construction.
- Fence off the construction camp and provide limited, appropriate access with signs; for Safety information and access control.
- Appoint a Security Guard; to Prevent damages to equipment and to keep unauthorized persons out.
SIGNIFICANT VEGETATION
WASTE OILS
WASTE SKIP
SERVICE YARD
WORKER'S HOUSING AND COOKING AREA
STORAGE CONTAINERS
MAIN SITE OFFICE
PARKING AREAS
ACCESS CONTROL
GUARD SHED
DIESEL STORAGE TANK
CHEMICAL TOILETS
FENCE
EARTH BERM

# APPENDIX 3

## Procon Environmental Technologies (PTY) Ltd.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Solving Environmental Challenges with World Class Technology


• Ultraspin Hydrocyclones Oil-Water Separators
• Vehicle Wash Water Reclaim Systems
• Remediation - Water & Soil
• Oil Spill Clean-up
• Environmental Degreasers & Cleaning Products
• MYCELX - Filtration

# APPENDIX 4

# Storm Water Management Guidelines

# STORM WATER MANAGEMENT PLAN IN TERMS OF THE PROPOSED UPGRADE OF ROAD K46 PHASE 2 BETWEEN THE PWV5 AND THE N14, DIEPSLOOT, JOHANNESBURG METROPOLITAN MUNICIPALITY

**OCTOBER 2014**

**Prepared for**

**GAUTENG PROVINCIAL DEPARTMENT OF ROADS AND TRANSPORT**

**By**

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| | |
|---|---|
| **REPORT TITLE:** | Storm Water Management Guidelines<br>in terms of the Proposed Upgrade of Road K46 Phase 2 between the PWV5 and the N14, Diepsloot, Johannesburg Metropolitan Municipality |
| **CLIENT:** | Knight Piésold Consulting Engineers |
| **REPORT STATUS:** | Draft |
| **GDARD PROJECT REFERENCE:** | GAUT 002/13-14/E0171 |
| **PLACE AND DATE:** | Pretoria, October 2014 |

## APPLICANT

| | |
|---|---|
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## ENVIRONMENTAL ASSESSMENT PRACTITIONER

| | |
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## DECLARATION OF INDEPENDENCE

I, JC van Rooyen as authorised representative of SPOOR Environmental Services (PTY) Ltd. hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor SPOOR Environmental Services (PTY) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SPOOR Environmental Services (PTY) Ltd. was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Proposed Upgrade of Road K46 Phase 2 between the PWV5 and the N14, Diepsloot, Johannesburg Metropolitan Municipality.

Signed…… Date……..……..

## REPORT DISTRIBUTION LIST

| Name | Institution |
|---|---|
| N. Buitendag | Gauteng Provincial Department of Roads and Transport (GPDRT) |
| George Smit | Knight Piésold Consulting Engineers |
| E Schmidt | Johannesburg Roads Agency |
| L Molefe | Johannesburg Metropolitan Municipality :Environmental Management and Compliance Monitoring |
| L Siwelane | Department of Water Affairs |

## DOCUMENT HISTORY

| Report | Date | Version | Status |
|---|---|---|---|
| K46_EMP_Storm Water Management Guidelines | June 2014 | 1.0 | Draft |
| K46_EMP_Storm Water Management Guidelines | October 2014 | 2.0 | Draft |

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| BA | Basic Assessment |
| BAR | Basic Assessment Report |
| BID | Background Information Document |
| CA | Competent Authority |
| CBO | Community Based Organisation |
| DWA | Department of Water Affairs |
| EAP | Environmental Assessment Practitioner |
| | Spoor Environmental Services (Pty) Ltd |
| EIA | Environmental Impact Assessment |
| EMS | Emergency Management Services |
| GDARD | Gauteng Department of Agriculture and Rural Development (CA) |
| GPDRT | Gauteng Provincial Department of Roads and Transport |
| I&AP | Interested and affected Party |
| NGO | Non-Governmental Organisation |
| PC | Principle Contractor |
| PPP | Public Participation Process |
| PTN | Portion |
| REM | Remainder of |
| SAHRA | South African Heritage Resources Agency |
| SANRAL | South African National Road Agency Limited |

# 1. INTRODUCTION

SPOOR Environmental Services (PTY) Ltd. was appointed by Knight Piésold Consulting Engineers as the Environmental Assessment Practitioner to manage the relevant environmental management processes related to the proposed upgrade of Road K46 Phase 2 between the PWV5 and the N14, Diepsloot, Johannesburg Metropolitan Municipality.

The principal goal of this document is to provide a set of Storm Water Management Guidelines as preventative measures to avoid erosion and sediment flows caused as a result of storm water runoff during and after the upgrade of the road K46.

Management guidelines are discussed under the following themes:

- Erosion control on bare open soils, open cuttings and on slopes,
- General road surface run-off management,
- Culverts and bridges, and
- Construction through wetlands.

These guidelines serve as an addendum to the EMPr in terms of erosion control and storm water management and should be used in reference to the project specific bio-physical characteristics. It is the opinion of the EAP that the principles contained within this document should be adopted by the Design Engineer in order to mitigate the effects erosion during periods of flooding and normal storm water runoff during and after construction.

# 2. LOCATION

In relation to the Gauteng Province the project site is located within the City of Johannesburg Metropolitan Municipality (CoJ) and to the north of the municipal centre. Furthermore, the Johannesburg Spatial Development Framework (CoJ, 2011) includes the site in Region A, sub area 3. Locally, the proposed K46 Road Phase II Upgrade is situated on the existing K46 (R511/ William Nicol Road between the PWV5 (Zeven Road area) in the south and N14 interchange (Summit Road area) in the north of Diepsloot. See Figure 1.

## 2.1. Stream Crossings, Wetlands and Road Surface Drainage Systems

The proposed upgrade of the road K46 will include the upgrade of two existing stream crossings (See Figure 2 & 3):

i. The first water crossing occurs at 900m south of the K46 (R511) & Summit Road intersection. The culvert cell structure crosses over a local stream flowing towards the Jukskei River in the west.
ii. The second water crossing occurs at 800m south of the K46 (R511) & Mnandi Road crossing. The culvert bridge crosses over the Diepsloot River, a tributary of the Jukskei River.

In both cases the crossings of the proposed road over the water courses will consist of a reinforced concrete box culvert structure. With the upgrade of the K46 Road, it is absolutely unavoidable that wetlands will be affected, especially during the bridge or culvert construction. The location of the medium ecologically sensitive wetlands is shown below.

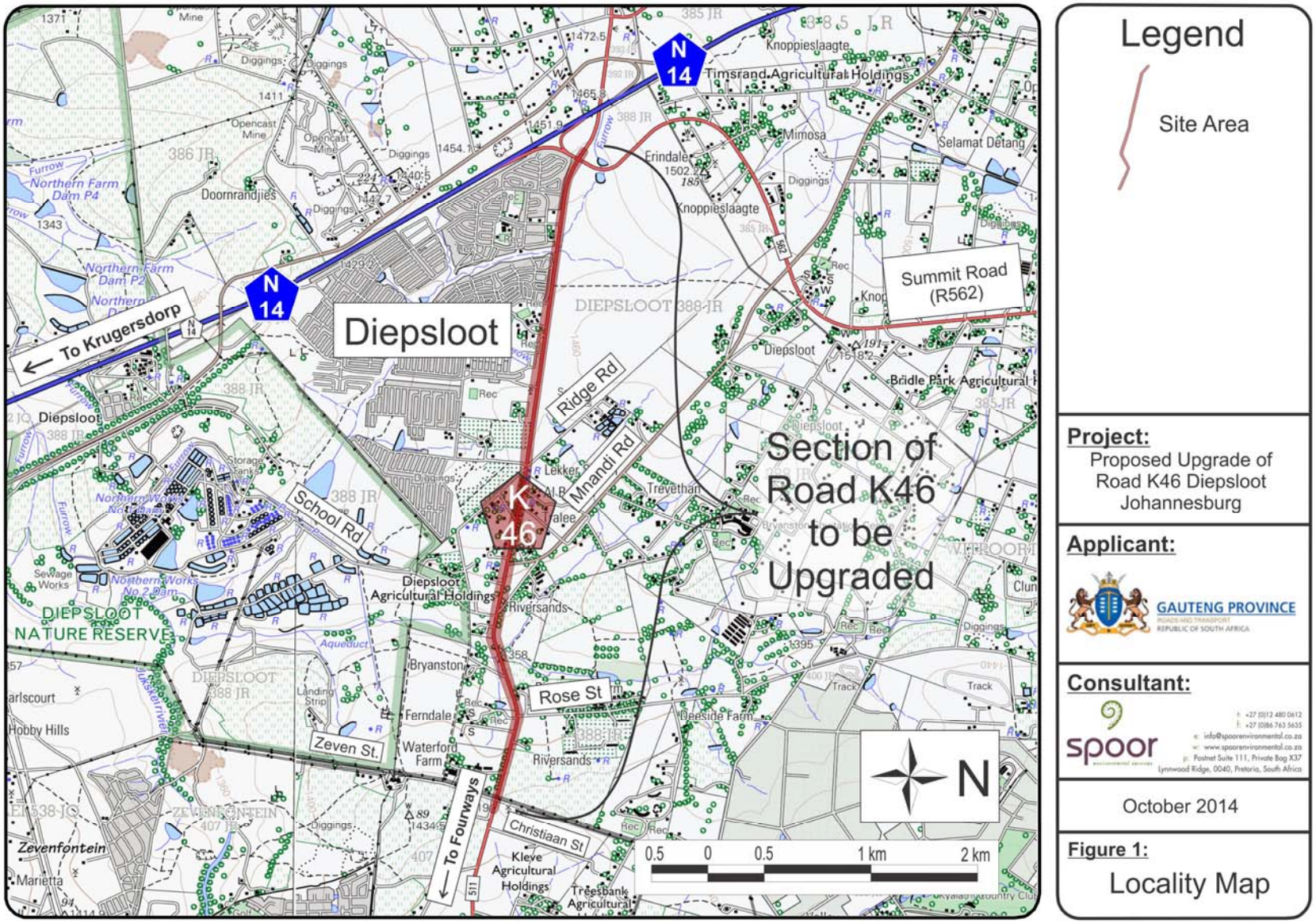



**Figure 1: Locality**

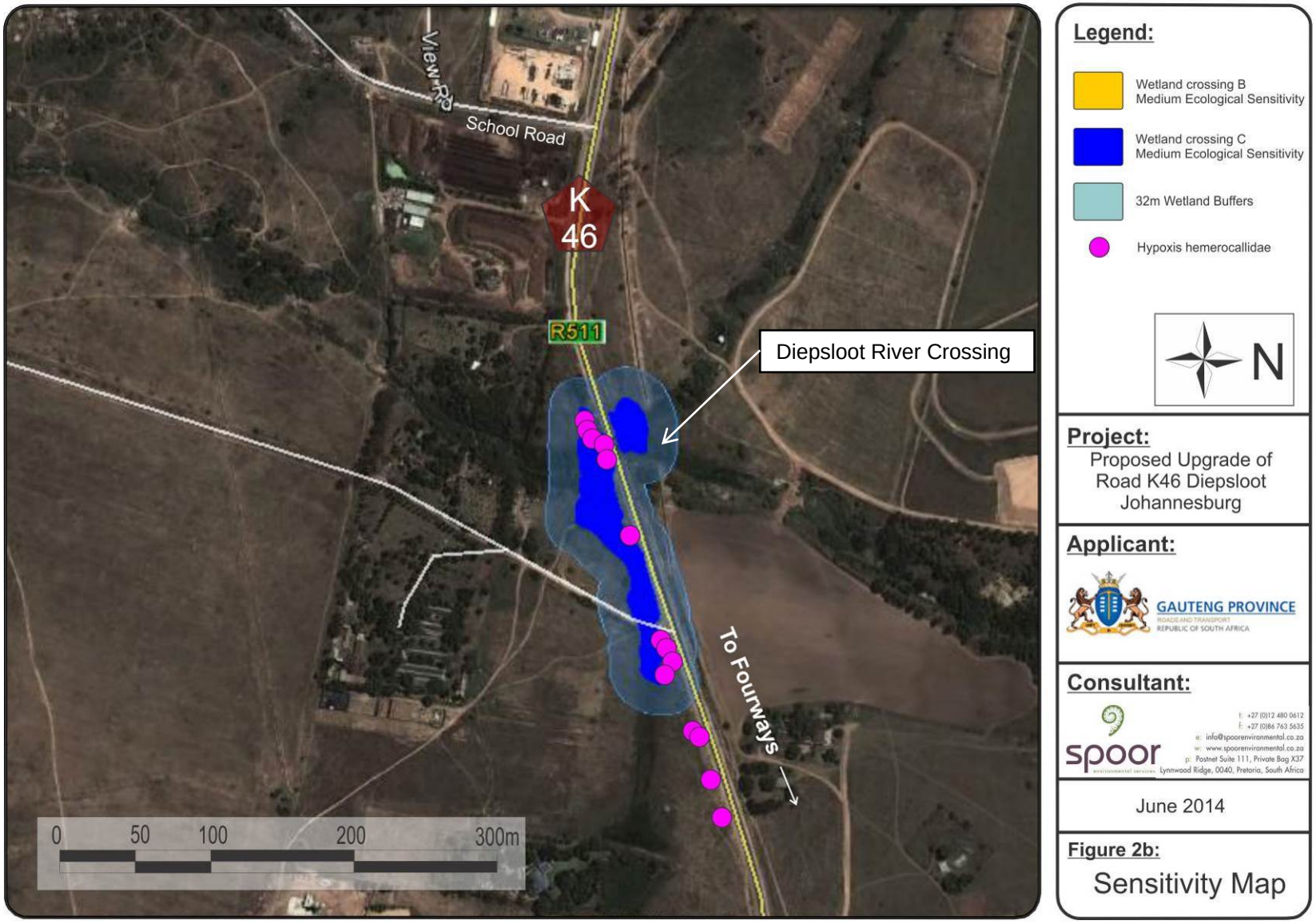



**Figure 3: Diepsloot River Crossing**

# 3. CULVERTS AND BRIDGES

## 3.1. Introduction

As aforementioned it is unavoidable that the receiving environments of the wetland crossing and the Diepsloot River with the associated wetland here will be affected. Impacts will occur both during the construction and the operation phases of the proposed road upgrade development. The challenge lies in obtaining a crossing solution over the said drainage features which is economical in terms of construction and long term maintenance cost but which will enable sustained and productive ecological functioning at the associated wetland and river systems.

## 3.2. Proposed Drainage Course Crossing Structures and Associated Impacts

In both cases the crossings of the proposed road upgrade over the water courses will consist of a reinforced concrete box culvert structure. See Figure. 5 & 6. Residential development and subsequent loss of storm water infiltration as a result of the increase of impenetrable paved areas causes the volumes and velocity of storm water to increase dramatically. Storm water is channelled and discharged in the natural drainage ways where it places the structures crossing drainage ways and the drainage ways itself under severe pressure. The primary impacts related to the proposed crossing structures include;

- Severance of the sub-surface water base flow between the sections of wetland above and below the wetland crossing;
- Erosion commencing at the toe of the outlet as a result of the failure of storm water management measures at the interface of the toe of the outlet structure and the natural drainage channel or wetland;
- Erosion channels forming from the toe of the outlet and growing downstream in the drainage way. Erosion channels deepens and widens over time and progressively drains the wetlands associated with the systems to cause wetland failure in terms of habitat and function over the long term;
- If left unattended failure of the culvert structure itself from position of the outlet and working its way back upstream. In extreme examples this may lead to the failure of the crossing structure itself over the drainage system.

Measures should therefore be implemented to ensure the sustained ecological functioning of the wetland as well as the conservation of the structural integrity of the proposed crossing structures. These measures will be discussed in the following sections.

## 3.3. Minor Culverts

A minor culvert can be defined as an outlet into a natural stream of channel or as a storm water discharge structure of a relatively small catchment area. The culvert can also be in the form of a pipe. Recommendations regarding discharge structures containing minor culverts include;

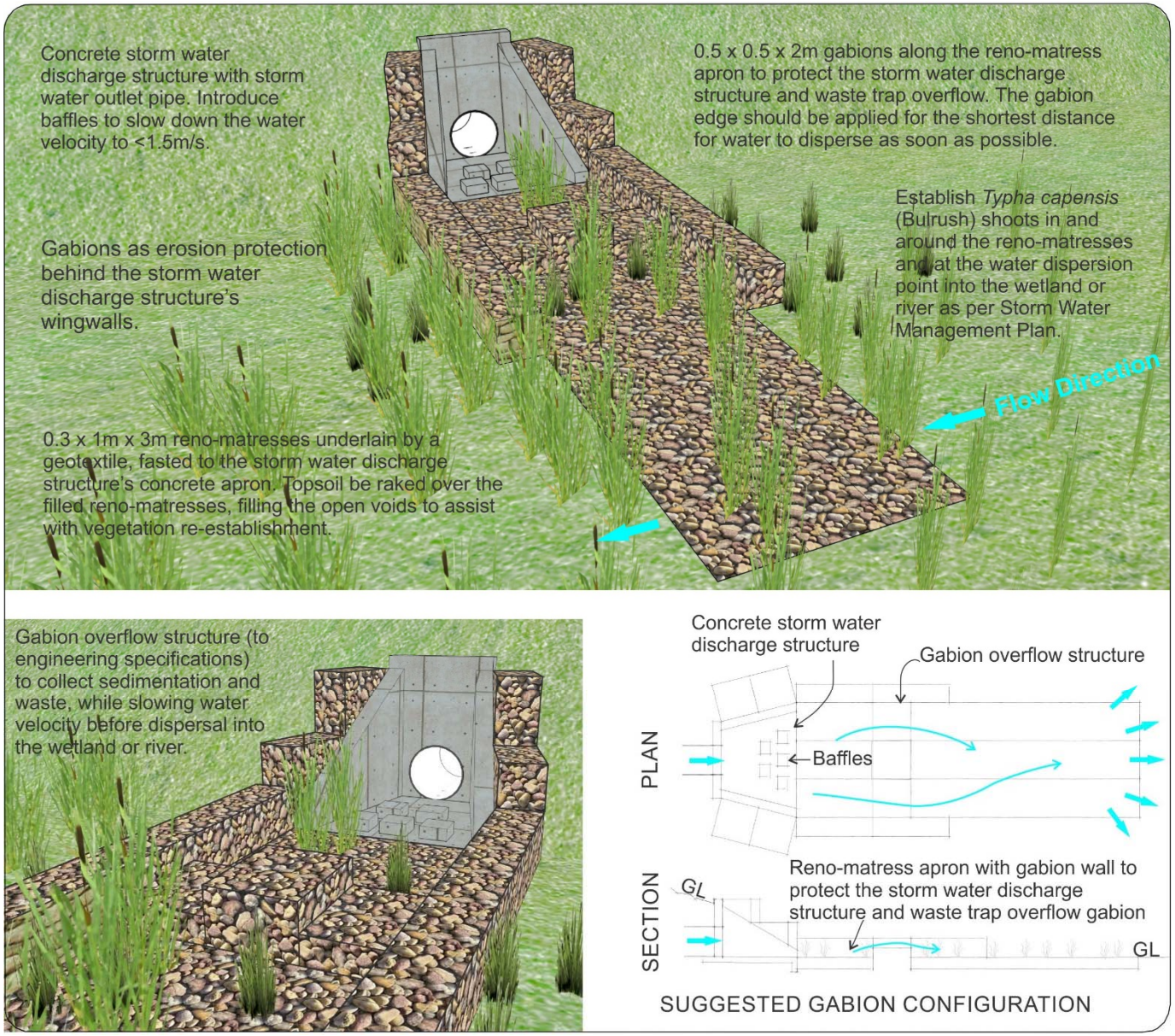
- All minor culverts discharging storm water into a natural drainage way must be constructed a part of an storm water discharge structure;

- Storm water discharge structures must include the headwall, wing wall and floor section and must be designed by the engineer to be able to safely discharge the storm water runoff;
- As far as possible, discharge structures shall not be positioned on a slope;
- If on a slope, the gradient where the discharge structure is constructed should be consistent throughout this section of the embankment to reduce the risk of erosion;
- The top and side slopes of the discharge structure must be protected against erosion. This can be accomplished with stacked gabion construction;
- The storm water discharge structures must be constructed to include energy dissipaters to reduce the velocity at which storm water drains into the natural drainage ways;
- Storm water shall be released to spread out at the outlet ensuring subcritical flow velocities, not exceeding 1.5m/s. This can be accomplished by implementing reno mattresses with gabion side protection, or similar solution;
- If on a slope the reno mattress discharge structure must be constructed downwards along the slope onto the wetland or river channel floor for a distance of at least three metres where the channel permits. The reno mattresses must be flanked by gabions and where the reno mattresses intersects the wetland or river channel floor, the reno mattresses and gabions must be angled in a downstream position;
- The storm water outlet structures should include waste traps and sediment traps to reduce the volume of waste and sediment flowing into the water courses and to create easily accessible cleaning mechanisms;
- Where the discharge structure abuts on the wetland or river channel floor itself reno mattresses must be employed to protect the gabions on the overflow side of the discharge structure;
- To allow for cleaning, pipe culverts should not be smaller than 750 mm diameter and box culverts not lower than 600 mm.
- See Figure 4 for a diagrammatic representation of a proposed outlet structure.

## 3.4. Major Culverts and Bridges

In the case of the proposed Road K46 Phase II Upgrade project a major culvert can be defined as a structure used to cross a section of wetland or small water course associated with a small to medium sized catchment area. See Figure 5 & 6. Recommendations regarding discharge structures containing major culverts include;

- The culverts and/or bridges to be constructed of the wetland area and the Diepsloot River are to be designed by a professional engineer to ensure that the subsurface flow of water in the wetland areas is not severed between the upstream and downstream positions of these structures.
- The design of such culverts and/or bridges should allow for wetland soil conditions to be maintained both upstream and downstream of the crossing to such a degree that wetland vegetation community structures upstream and downstream of the crossing are maintained;
- The COLTO Standard Specifications for Road and Bridge Works for State Authorities 1998 (Green Book) as well as the standards and specifications of the South African Roads Agency (SANRAL) Limited: Drainage Manual must be implemented here. In addition;
  - *i. The design of such culverts and/or bridges should ensure that the permanent wetland zone should have inundated soil conditions throughout the year extending to the soil surface;*




**Note:**
This is a diagrammatic representation of a storm water discharge structure and should be adjusted by the Engineer according to the storm water volume and velocity.

**Project:**
Proposed Upgrade of Road K46 Diepsloot Johannesburg

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October 2014

**Figure 4:**
Diagrammatic Representation of a Proposed Outlet Structure

**Figure 4: Proposed minor culvert system**

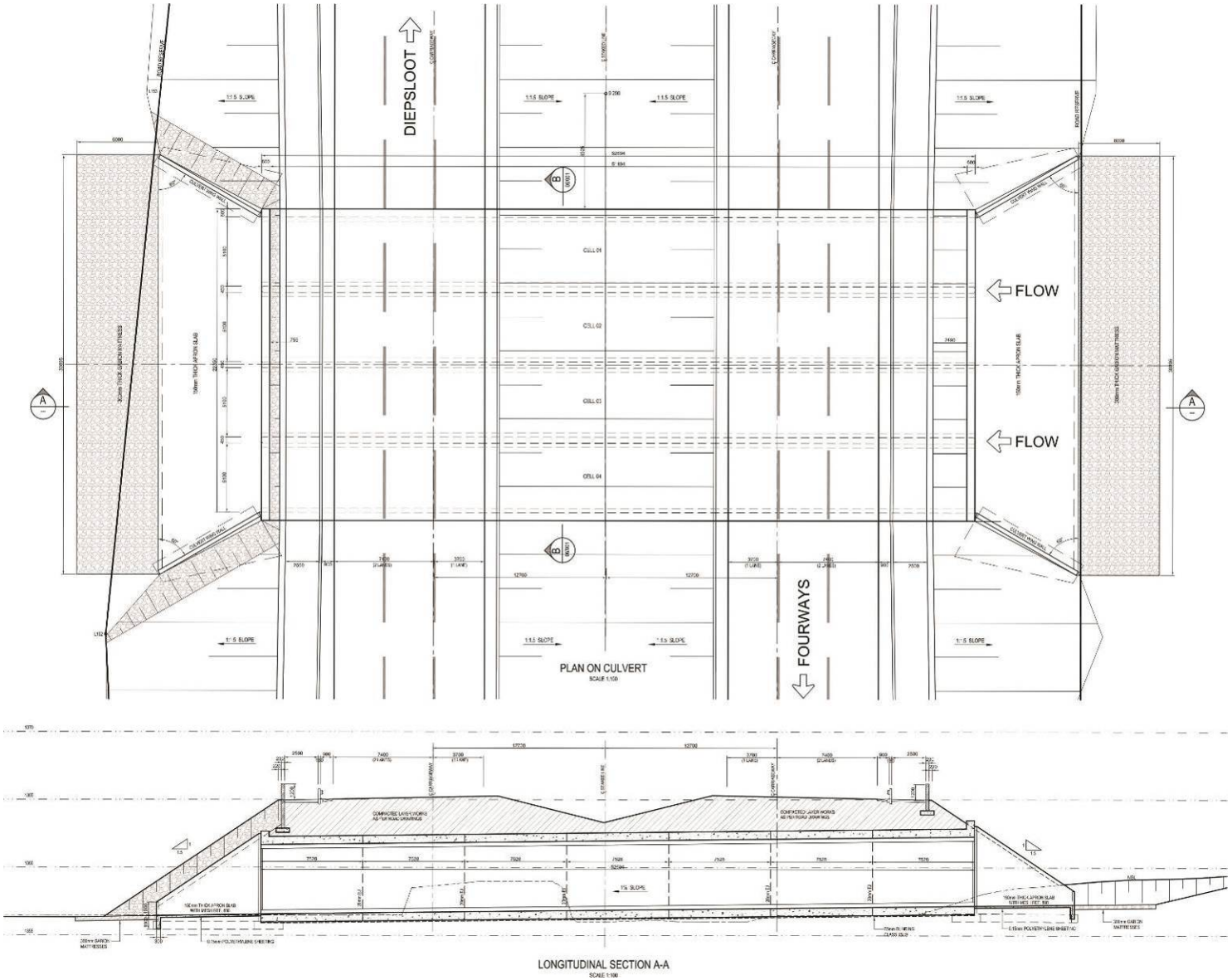


**Figure 5: Reinforced box culvert structure to be implemented at the Diepsloot River**

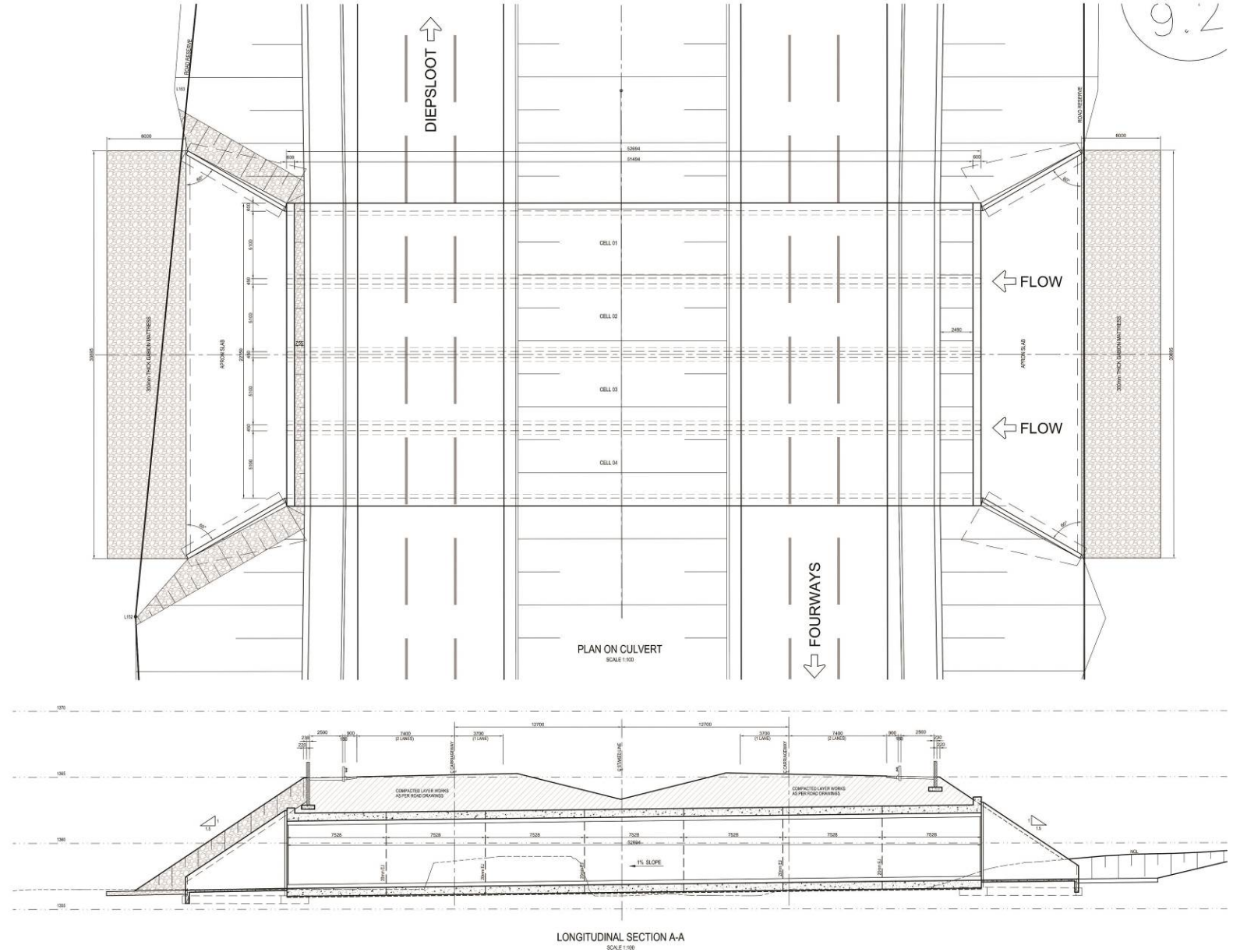


**Figure 6: Reinforced concrete box culvert structure to be implemented at the wetland section**

*ii. The design of such culverts and/or bridges should ensure that the seasonal wetland zone should have water-logged soils within 300mm of the soil surface at all times;*

*iii. Temporary wetland zone areas should have waterlogged soil conditions occurring to within 300m of the land surface during the summer season. (SAS, 2014)*

- The channel of the culvert or bridge structure must be angled to be parallel with the natural stream flow direction to decrease erosion of the wetland and river embankments downstream of these structures;
- The culverts and bridges are to be designed by a professional engineer to ensure that the structures does not cause erosion of the wetland or the river channel floor downstream of these structures;
- Reno mattresses must be laid in the downstream wetland and river channel floor positions of the wetland and River system for a minimum of 10 meters;
- The Reno mattresses must be laid to ensure a long term suitable connection with the downstream toe end of the reinforced concrete box culvert crossing structures;
- The embankments on the up-and downstream positions of the culverts and/or bridges must be protected via stacked gabion structures or similar anti erosion measure for a suitable distance to ensure long term stabilization of the areas around the culvert and/or bridge structures and to curb erosion in these positions.

# 4. CONSTRUCTION THROUGH WETLANDS

Additional mitigation and rehabilitation measures recommended by the wetland Specialist to be considered during bridge or culvert construction are as follows;

- Disturbance to any wetland crossings must be minimised;
- Ensure that no incision and canalisation of the wetland system takes place as a result of the construction of the culverts;
- It must be ensured that flow connectivity along the wetland features is maintained;
- Re-profiling must be performed at the banks of disturbed wetland areas post construction to return the embankments to a functional state for the long term sustained existence of the wetland;
- Edge effects of activities including erosion control need to be strictly managed in the wetland areas;
- Implement an alien vegetation control program within wetland areas associated with the proposed development.

# 5. EROSION CONTROL ON BARE SOILS, OPEN CUTTINGS AND EMBANKMENTS

To avoid erosion of exposed soils left bare after construction as well as the channel and embankment areas of the drainage features mitigation measures should be considered in terms of the:

- Embankment rehabilitation;
- Soil preparation for embankments, the road reserves and other bare areas;
- Establishment of vegetation cover;
- Watering programme, and

- Monitoring and maintenance.

## 5.1. Embankment Rehabilitation

- All cuttings not situated in solid material (i.e. in rock material) and which include disturbed erodible material, should be re-shaped to a stable natural uniform landform along the entire length of the disturbed area;
- Clear all construction spoil material and debris so that the toe end of the embankment terminates at its original position;
- Grade both the crest and the toe areas of the embankment to form a more natural flowing land form;
- Fill all depressions and uneven areas to form an even land form over the entire embankment area;
- Before any topsoil is placed on slopes with a gradient of 1:2, the subsoil should be ripped or scarified by hand or mechanically along the contours to form a proper bond between subsoil and topsoil;
- Concentrated surface run-off on a long slope should be released in a controlled manner as discussed in Section 4;
- All bare soil areas must be vegetated as discussed in the sections below.

## 5.2. Soil Preparation

*Soil Preparation for Embankments*

- Topsoil to a minimum of 150 mm (preferably 300 mm) must be spread evenly over the entire embankment area;
- Topsoil shall be free of detrimental salts and other impurities harmful to plant growth, weeds, stones or similar objects no larger than 25 mm in any dimensions, also brush, roots and other objectionable vegetal matter, litter or any other foreign material unsuitable or harmful to plant growth;
- Topsoil shall not be striped, collected or deposited while wet;
- Apply 4:3:4 (36) or 2:3:2 (22) at a rate of 5kg/m² over the whole area to be established and rake into the topsoil;
- Topsoil shall not be extremely acid or alkaline. The pH shall be in the range of 6-7;
- For slopes steeper than a gradient of 1:3, additional biodegradable erosion containment in the form of biomats (BioJute®, Bio Mac®, etc.) should to be installed to assist in re-vegetation of the slope;
- For slopes steeper than a gradient of 1:1, engineered erosion protection such as Gabions, Armorflex® or segmented paving should be installed.

*Soil Preparation for Bare Areas*

- Compacted areas must be ripped in two directions and at 90°, to a minimum depth of 150 mm and with the final direction of ripping to be along the contour;
- Apply 4:3:4 (36) or 2:3:2 (22) at a rate of 5kg/m² over the whole area before the ripping and scarifying is performed;
- The area must furthermore be covered by a topsoil layer of no less than 300mm;
- Topsoil shall not be extremely acid or alkaline. The pH shall be in the range of 6-7;
- Topsoil shall be free of detrimental salts and other impurities harmful to plant growth, weeds, stones or similar objects no larger than 25 mm in any dimensions, also brush, roots and other objectionable vegetal matter, litter or any other foreign material unsuitable or harmful to plant growth,

- Topsoil shall not be striped, collected or deposited while wet;
- Scarify all remaining bare soil areas to a minimum depth of 150mm and with the final direction of ripping to be along the contour;
- All loose stones larger than 50 mm must be removed from the planting area;
- Fill all depressions and even out all uneven areas to form an even land form.

## 5.3. Re-vegetation

*Establishment of the Grass Cover*

- The entire area must be hand seeded with a seed mix and rate per hectare as provided below;
- The areas to be seeded shall unless wet be thoroughly watered before seeding to ensure that soil will be uniformly wet over a depth of at least 150 mm when seeding takes place;
- For slopes steeper than a gradient of 1:3, additional biodegradable erosion containment in the form of biomats (BioJute®, Bio Mac®, etc.) should to be installed to assist in re-vegetation of the slope;
- The grass seed mix (re-vegetation mix) used must be representative of the project area's vegetation and must be a combination of pioneer, sub-climax and climax grasses;
- The proposed seed mix are as follows:
    - *Cynodon dactylon* 3,5kg/ha
    - *Eragrostis plana* 2.0kg/ha
    - *Setaria sphacelata var sphacelata* 2.0kg/ha

- If not available the *Eragrostis curvula, Eragrostis tef, Cynodon dactylon and Digitaria eriantha. Panicum maximum, Cenchrus ciliaris* and *Chloris gayana* as provided in the Mayford Veld mix can also be used. (http://www.sakata.co.za/VELDMIX.php);
- Only good quality fresh seed shall be used. Agricol (012) 813 8079 is a specialist grass seed provider can be contacted for advise in this regard;
- The seeding, must be done with the seed mixed with an equal quantity of river sand;
- To ensure even distribution sowing must be done in two passes over the area and at 90°;
- The seed application must be done directly onto the rough un-raked ripped surface;
- The entire seeded area must be thoroughly wetted down after seeding to fix the seed to the soil surface ad to prevent undue drying out;
- Ensure that the area is not traversed by any vehicle or unnecessarily by foot for a period of at least two months after the re-vegetation has been done.

*Planting of Typha capensis (Bulrush) on the banks of waterways*

*Typha capensis* or Bulrush is an indigenous fast growing aquatic species with a distribution range throughout South Africa. It occurs commonly along rivers, wetlands, dams and marshes and has a variety of uses in the medicinal, economic and agricultural fields. In terms of it ecological role in watercourses it serves as a source of food and habitat for faunal species and also protects the edges of water courses. It is recommended that sections of the waterways' banks be planted with Bulrush to protect the banks against erosion and to enhance the local micro environment. Bulrush can be established as follows;

- Collect Bulrush cuttings from surrounding water courses where well established populations exist;

- Bulrush cuttings may not be collected from a single area and depleted here but should be collected randomly over a larger area;
- Cuttings must be collected between the months of November and February;
- Cuttings must consist of a section of at least 200 mm of the Bulrush rhizome with sufficient roots attached;
- The cutting's foliage can be removed at 400 mm above the rhizome;
- Plant the bulrush cuttings at 3 cuttings / $m^2$ in the wetland channel and the river channel floor along all of the areas disturbed during the construction process;
- Bulrush cuttings must be planted on the edge of the waterline in water-logged soils,
- Bulrush cuttings must be planted at a minimum depth of 200 mm;

As much vegetation growth as possible should be promoted within the disturbed sections of the wetland areas and the Diepsloot River channel in order to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species only.

*Tree Planting*

If trees are to be planted as part of the re-vegetation of the disturbed areas along the road alignment and along the Wetland and Diepsloot River, four Highveld species, fond of growing along streams and riverbanks, are recommended:

- *Salix mucronata* (Cape Willow/ Kaapse Wilger)
- *Cetis africana* (Witstinkhout/ White Stinkwood)
- *Rhus lancea* (Karee)
- *Combretum erythrophyllum* (Vaderlandswilg/ River Bushwillow)

Trees should be planted in the following manner:

- Prepare a 1 m x 1 m x 1 m hole for each tree to be planted;
- Prepare a soil mixture of 500 gms 2:3:2 (22) fertilizer, 500 gms Superphosphate, 2 parts per volume well decomposed compost and 8 parts per volume of the soil removed from each tree hole;
- Backfill each tree hole with the soil mixture to the level that the whole of the tree's root ball will be covered when placed in the whole;
- Compact the backfilled soil lightly before placing the tree in the whole;
- Place each tree in the whole and replace the remainder of the soil mixture around the root ball;
- Compact the backfilled soil slightly around the trees to ensure that they stand firmly in position;
- Fix each tree to a suitable timber stake to stabilize it after planting,
- Create a soil berm 20 mm high and 1 m diameter around each tree for watering purposes;
- Water each tree thoroughly after planting.

## 5.4. Watering Programme

- The total re-vegetated area must be watered on a bi-weekly basis for the first three months after the Storm Water Management Plan has been implemented, after which watering can be reduced to one a month during the first year. Watering can then be terminated;
- All trees must be watered on a weekly basis for the first three months upon which watering can be reduced to once a month during the first year after being planted. Watering can then be terminated;

- Watering must be adapted in terms of the rainfall pattern;
- Do not over water the re-vegetated areas as the exposed surface may erode due to early exposure to surface drainage and flooding.

### 5.5. Site Monitoring and Maintenance

- Site monitoring must be done by the Contractor on a monthly basis and for a period of one year after the rehabilitation has been completed;
- The Contractor shall be solely responsible for establishing an acceptable vegetation cover and for the cost of replanting where acceptable cover is not obtained;
- Any signs of erosion or failing of the embankment or the surrounding rehabilitated areas must be reported to the Contractor and must be repaired straightaway;
- Maintenance of the vegetation cover will include reseeding of grass on embankments and other bare areas to ensure a 100% coverage;
- There shall be no bare patches of more than 500 mm maximum dimension;
- Weeds and other alien vegetation must be removed as part of the monthly monitoring of the rehabilitated area for at least one year after completion of the rehabilitation activities and on an on-going basis as part of responsible environmental management by the GPDRT.
- Alien / weed control need to be strictly managed in the wetland and river areas, and an alien vegetation control program needs to be implemented in accordance with the recommendations of the EMPr.

## 6. GENERAL ROAD SURFACE RUN-OFF MANAGEMENT

- Storm water drainage inlets along the upgraded road should be determined by the design engineer at regular intervals along the route;
- For road sections on fill, the run-off should be contained on the road surface and released into down shoots or storm water side curb inlets at regular intervals, in order to curb sheet run-off onto fill slopes as an erosion control measure;
- The road median should be shaped to concentrate run-off to the storm water drop inlets;
- The road median should not be paved and must be vegetated with a 100% grass cover to decrease sediment and debris flow into the drop inlets;
- Appropriate erosion control as indicated in section 3 should be implemented at all storm water discharge ends;
- The storm water systems need to be cleared of urban waste that ultimately ends up in the urban water courses.

## 7. CONCLUSION

The storm water management guidelines and rehabilitation measures developed for the proposed Road K46 Phase II upgrade sets out to identify possible areas where erosion can occur during and after the construction phase. The guidelines provided in this document must be taken into account by the design engineer and the principal contractor during the pre-construction planning and design phases as well as in the construction phase itself. . It is believed that the erosion control measures presented will provide suitable solutions to prevent possible erosion related impacts on the receiving environment.

Finally it is critically important that the relevant monitoring and maintenance be performed on a concurrent basis in order to ensure the long term integrity of the new infrastructure as well as the sustained productive functioning of the local wetlands and the Diepsloot River.

**PLEASE NOTE:**

- The recommendations made in this report are made in the light of achieving a state of sustained ecological functioning of the general site environment after construction and during the operational phase of the proposed upgrade Road K46 Phase II. Recommendations made in terms of any civil infrastructural component of the proposed roads and associated infrastructure must first be studies by the design Engineer and certified before implementation.
- The most preferable design solutions for the crossing of the wetlands and the Diepsloot River would include structures spanning these natural features with supporting beams and pillars which is situated outside of the main wetland area and Diepsloot River stream channel. It is understood that these kinds of spanning structures is expensive and uneconomical in relation to the proposed upgrade of road K46 Phase II. The recommended mitigation measures are those that are deemed appropriate in relation to the reinforced concrete box culvert infrastructure designed for the purposes of crossing the wetlands and the Diepsloot River. ***Concurrent maintenance of the recommended rehabilitation infrastructure will be imperative in order to achieve the sustained ecological functioning of the receiving environment and the structural integrity of the proposed new road infrastructure.***

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