



ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

for

PROPOSED WIDENING OF CONRAD BRIDGE OVER BRAAMFONTEIN SPRUIT, CITY OF JOHANNESBURG, GAUTENG PROVINCE

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ACRONYMS & ABBREVIATIONS

EA	Environmental Authorisation
ECO	Environmental Control Officer
ELO	Environmental Liaison Officer
EMPr	Environmental Management Programme
GDARD	Gauteng Department of Agriculture and Rural Development

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial and riparian vegetation may or may not be present

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Environment: the surroundings within which humans exist and that are made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foreground that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Expansion: means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

General waste: Waste which does not pose an immediate hazard or threat to health or to the environment' and includes the following waste flows: domestic waste, construction and demolition waste, business waste, insert waste.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Waste that has the potential to cause a negative threat/impact to humans and/or the environment. It includes, but is not limited to, batteries, neon lights, fluorescent lights, printer cartridges, oil, paint, paint containers, oil filters, IT equipment etc.

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Maintenance: means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Topsoil means that layer of soil covering the earth and which provides a suitable environment for the germination of seed, allows the penetration of water, is a source of micro-organisms, plant nutrients and in some cases seed, and of a depth of up to 0,3m. Topsoil (top 300mm as a minimum) must be temporarily stockpiled separately from subsoil or rocky material (the topsoil contains both the seedbed and nutrient supply necessary for plant

growth - if mixed with subsoil layers the usefulness of the topsoil for rehabilitation will be lost) Topsoil shall be stripped from all areas to be utilized during construction period and where permanent structures and access is required

Waste: As per National Environmental Management: Waste Act means-

- a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or
- b) disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or
- c) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstance support vegetation typically adapted to life in saturated soil.

Watercourse: as per the National Water Act means -

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

1. INTRODUCTION AND BACKGROUND

Envirovolution Consulting (Pty) Ltd (Envirovolution Consulting) has been appointed by Triakon Engineers to undertake a Basic Assessment process on behalf of the Johannesburg Roads Agency (hereafter “JRA”) as an independent environmental consultancy to undertake the Basic Assessment (BA) for the Proposed Widening of Conrad Bridge over Braamfontein Spruit, City of Johannesburg, Gauteng Province. The proposed site falls under the jurisdiction of City of Johannesburg Metropolitan and it is located between Jan Smuts Avenue and Hillcrest Weg. Refer to Figure 1 below.

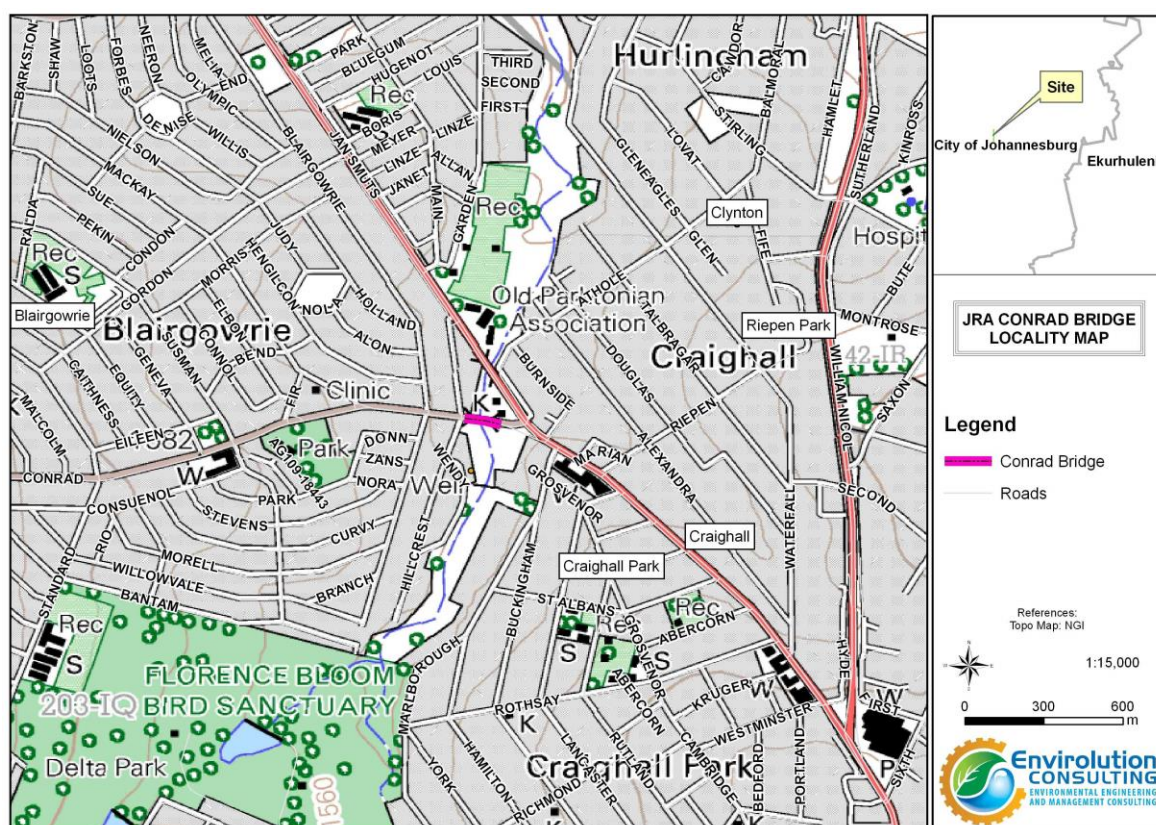


Figure 1: Locality Map showing the project study area.

Project Details

The proposed project entails the widening of the Conrad Bridge over the Braamfontein Spruit of which activities will involve the widening of the bridge northwards to accommodate two lanes from Blairgowrie to Jan Smuts Avenue. It is proposed to signalise the Blairgowrie drive and Conrad drive intersection. The bridge is proposed to be expanded by 30 metres in length and 19 metres wide (proposed footprint) over the Braamfontein spruit. In addition bank erosion where the existing Bridge is will be resolved. This will therefore result in infilling or removal of $5m^3$ or more of material into/from a watercourse during construction. The proposed upgrades will enable flow of

traffic from Blairgowrie area onto Jan Smuts avenue as well as resolve bank erosion along Braamfontein spruit. The construction activities on site are envisaged to last for a period of 6months

It is understood that any development can pose various risks to the environment as well as the residents or businesses in the surrounding area. These possible risks should be taken into account during the planning phase of the development. The purpose of this document is to provide management responses that will ensure that the impacts of the development are minimised. This EMPr is, therefore, a stand-alone document, which must be used on site during each phase of the development (planning, construction and operational phases).

This document should be flexible so as to allow the contractor and developer to conform to the management commitments without being prescriptive. The management commitments prove that the anticipated risks on the environment will be minimised if they are adhered to consistently. The onus set out in the EMPr rests with the developer, main and subcontractors, which promotes responsibility and commitment. Any parties responsible for transgression of the underlying management measures outlined in this document will be held responsible of non-compliances and will be dealt with accordingly.

Aims and objectives the EMPr

The purpose of this Construction EMPr is to provide an easily interpreted reference document that ensures that the project environmental commitments, safeguards and mitigation measures from the environmental planning documents, project approvals, and Scope of Works are implemented. It aims to minimise impacts associated with the construction phase of the development on the environment are kept to a minimum. This includes ensuring that the mitigation measures described in the Basic Assessment Report (if required) are implemented, to ensure continued monitoring of the construction phase and to ensure the involvement of interested and affected parties (IA&Ps) in a meaningful way.

The objectives for the EMPr are:

- To develop, implement and maintain effective management systems for the environmental aspects of the development and associated works.
- To document details of environmental protection measures and controls so that they are able to provide long term protection for the natural environment;
- To ensure compliance with relevant legislation (National, Provincial and Local), regulatory requirements and environmental documents;
- To maximise the value and outcomes of environmental monitoring activities so that identified impacts are controlled and minimised;
- To ensure that all Environmental Management considerations are implemented during the operational and maintenance phases of the project.

The EMPr has been developed based on the findings of the on site assessment undertaken by Envirolution and the following specialist studies undertaken during the basic assessment process of this project:

- Wetland Delineation and Functional Assessment Report undertaken by Limosella Consulting, June 2015.
- General wetland rehabilitation and monitoring plan undertaken by Limosella Consulting to mitigate construction related impacts, June 2015.
- Heritage Impact Assessment undertaken by a Heritage Consultant J van Schalkwyk (D Litt et Phil), June 2015.
- Traffic Impact Assessment undertaken by a traffic and transport engineer Mr Maupi David Letsoalo of Oarona Consulting and Engineering (Pty) Ltd, May 2015

All the Environmental specifications and the procedures discussed in this document were also developed in accordance with the relevant legislation applicable to the development.

2. PREPARATION OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

This draft Environmental Management Programme was compiled by:

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Expertise of Environmental Practitioner that prepared the EMPr

Ms. Jubilee Bubala the principle author of this EMPr holds a Master's of Science degree from the Witwatersrand University. She has 8 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; environmental auditing and compliance reporting; the identification of environmental management solution and mitigation/risk minimising measures; environmental auditing, monitoring and reporting compliance; and developing and implementing ISO 14001:2004. Jubilee has been a project scientist for various EIA's in South Africa and Southern Africa. Jubilee is currently a Project Manager and Environmental Scientist at Envirovolution (refer to curriculum vitae attached within **Appendix I** of the BAR report.

3. DESCRIPTION OF POTENTIAL IMPACTS

The proposed road and bridge widening will impact on the riparian components of the Braamfontein Spruit. If mitigation and rehabilitation is not done, a significant negative impact could result which can extend to downstream watercourses. The most important impact is related to how the watercourse is crossed by the road. If water is focused below the road by, for example should insufficient width be allowed for dissipated flow, the concentrated water flow will result in erosion and further channel straitening. It is therefore very important that this feature be incorporated into the design phase of the project and carefully monitored

Furthermore, disturbance of the soil layers and compaction of soil around the construction footprint as well as along servitudes may result in erosion and subsequent

sedimentation of the Braamfontein Spruit. Therefore, the successful re-establishment of vegetation is imperative in order to limit impacts on the watercourse.

The following main impacts are expected to be associated with the road and bridge widening:

Changing the physical structure within a water resource: One riparian area was recorded on site. The stream currently flows from south to north. It is likely that this riparian area previously had characteristics similar to a valley bottom wetland and that the increased urbanisation has led to an increase in water flow into the stream which ultimately reshaped the stream and now shares more characteristics with a river than a wetland. The EIS score of 1.0 falls into a category characterised by Moderate ecological importance and sensitivity. These watercourses are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers.

The riparian area is greatly disturbed by current and historical anthropogenic activities as well as increase in urbanisation and associated increase in hardened surfaces within the catchment. The vegetation cover of the riparian is therefore largely different from historical conditions and the majority of the woody and the non-woody vegetation is exotic. The combined EC scores for the riparian area on the study site is an E - Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive. The combined QHI score for the riparian area on the study site is an E - Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive. Mitigation and rehabilitation discussed in the accompanying report (Limosella 2015) should be closely implemented and monitored in order to prevent further degradation of this (and downstream) section of the Braamfontein Spruit.

This project entails the construction of widening of the existing Conrad Bridge over the aforementioned watercourse. There may be a risk of further degradation such as changing the physical structure within a water resource: Construction of the proposed bridge will impact on the physical structure of the watercourse by disturbing the soil profile and the bed and banks of the riparian habitat. This will occur if mitigation measures are not followed.

Mobilisation of pollutants: Accidental pollution or illegal disposal and dumping of construction material such as cement or oil, as well as disposal or discharge of human (including partially treated and untreated sewage) into water resources will influence the water quality of watercourses, thereby influencing its functionality and the persistence of vegetation. Furthermore, the surrounding areas are already exposed to pollution which during high rainfall events could be washed into the watercourses – especially if vegetation cover is not sufficient to slow down water and filter pollutants.

The EMPr is designed to mitigate this type of pollution and other disturbances and should be constantly adhered to by the contractor to mitigate degradation and pollution of the watercourse, **Figure 2** indicates wetland sensitivity and the buffer zones in relation to the proposed development that were delineated by the wetland specialist.

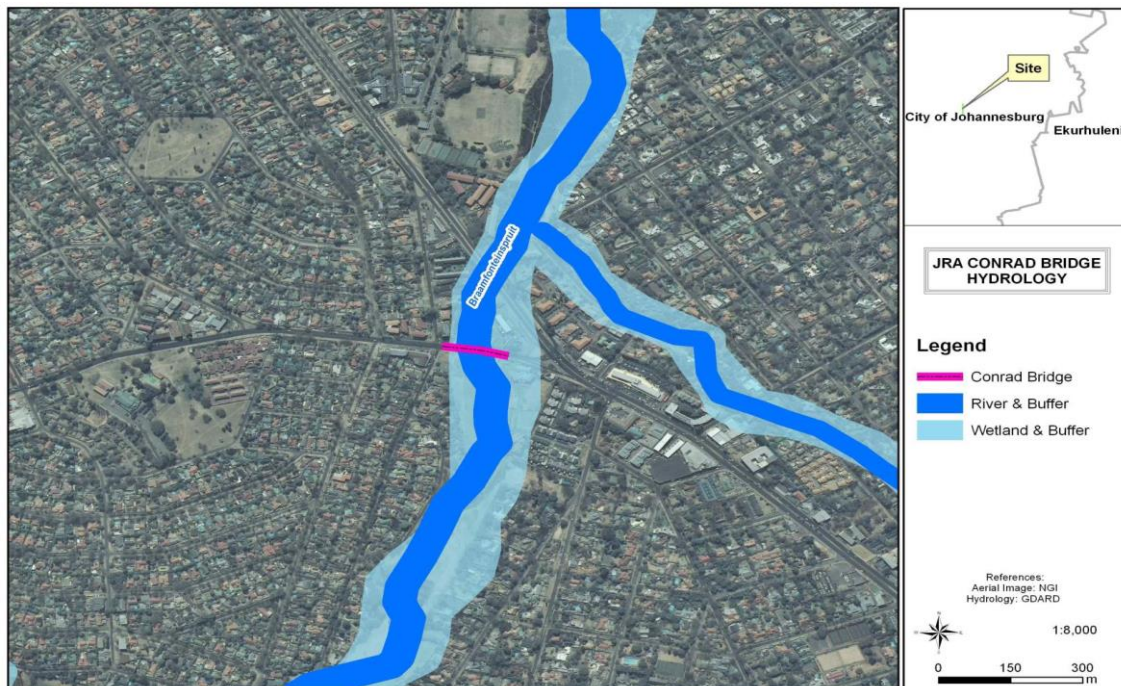


Figure 2: Wetland Sensitivity areas delineated together with buffer zones (Limosella Consulting, October 2015)

Invasion by alien invasive vegetation: The plant species composition is already dominated by alien plants. These plants provide an important function in stabilizing soils and attenuating high energy surface water flows. However, plants listed as invader species (Category 1 and 2) as detailed in the Conservation of Agricultural Resources Act (Act 43 of 1983) and the proposed amendments of 2000, should be removed, and prevented from establishing. The seeds of these alien invasive species that occur on and in the vicinity of the construction area could spread into the disturbed or stockpiled soils. In addition, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds to the construction sites. From these construction sites, alien invasive plant species can easily spread downstream; likely resulting in offsite impacts.

Clearing/removal of natural vegetation: The plants that grow in riparian areas are vital for preventing erosion, they play a role in the purification of water, reducing the severity of floods and regulating water, especially during droughts. The moment the vegetation is destroyed, these valuable functions disappear. In addition, vegetation around watercourses, especially upslope, holds soil in place and slows down water runoff

during rainy events. The vegetation thus promotes groundwater recharge, while protecting soils from eroding, subsequently causing sedimentation in watercourses. The majority of the indigenous vegetation was thus replaced with lawn and only some large trees remain adjacent to the stream channel (Figure 3).



Figure 3: Shows a few large trees that remain adjacent to the stream channel (left): Vegetation replaced by lawn grass (right).

No species of conservation concern are expected to occur on the study site. The vegetation component of the site is therefore not considered to be sensitive. The proposed development will therefore have very little impact on the indigenous wetland vegetation.

Soil Erosion potential: Removal of stream bank vegetation, vegetation against slopes and compaction of soils, expose the resulting bare soils to erosion during rainfall events. Erosion removes the top soil layer, thereby preventing the successful establishment of indigenous vegetation on eroded soils. Eroded areas are likely to be colonised by alien invasive and pioneer plants, or in severe cases, no vegetation will establish causing high velocity runoff during rainfall events and continuous erosion. The potential significance was rated as having a predominately medium significance

The cumulative soil erosion potential for the site is considered low due to increase in urbanisation and associated increase in hardened surfaces within the catchment. This proposed development will have a relatively minor contribution to cumulative impact on the area.

Sedimentation of watercourses: Soil erosion could lead to increased sedimentation and turbidity downstream of the activity, which in turn reduce the water storage capacity thereof, smother vegetation, and decrease oxygen concentration. Low oxygen environments are detrimental to invertebrate and fish species that may occur in these habitats. The potential significance was rated as having a predominately medium significance.

Compaction of soils: Construction activities may compact soils from heavy equipment access which could inhibit seed germination, reduce water infiltration, inhibit root establishment, and result in bare soil exposure. In particular, soil compaction can lead to an increase in runoff during rainy events, which in turn results in increased sedimentation.

Traffic impact: The development involves road reconstruction and widening of the Conrad Bridge. This activity will result in traffic delays and also traffic congestion (both road users and construction vehicles) at the study site. The impact was identified to be of medium significance and with mitigation it can be reduced to low.

Visual Impacts: The potential significance was rated as having a predominately low significance. The potential impact on sensitive receptors (businesses and residents of built up areas) in close proximity of the study area will be of medium significance and with mitigation the impact can be reduced to very low. Within the region, the anticipated visual impact on users of the arterial, roads, is also Low.

Heritage impacts: From the survey it was determined that, although the Conrad Drive Bridge does not exhibit any remarkable construction techniques, nor can it be linked to any event or person, few, if any similar bridges are still to be found in the larger region. In addition, it is older than 60 years and therefore enjoys general protection under the National Heritage Act. From the above the following statement can be made:

- The Conrad Road Bridge is therefore judged to have high significance on a regional level. When considering the impact of the proposed development, the following principle should be considered: heritage informs design. It is therefore proposed that:the bridge should be retained as is and that any development at the bridge should be done in sympathy with the bridge in order to retain it for posterity. This was done very successfully for example during the construction of the Gautrain Rapid Rail System.
- Other than the built up existing infrastructure, no other heritage resources were identified during the survey. However due to most of the features occurring underground e.g. graves, they maybe accidentally exhumed during excavation which is unlikely as such features would already have been exhumed if they existed by previous anthropogenic activities on the study site. Therefore the likelihood of such features occurring is improbable. Impact on heritage was therefore identified to be of medium to low significance.

Other potential impacts that may occur during the construction phase will include noise, health and safety impacts, waste management, soil contamination, social and economic impact and air quality impacts. These impacts were all recorded to be of medium to low significance and with mitigation they can be reduced to low and very low. No impacts of Very high significance are envisaged to occur on site

It thus of utmost importance that the mitigation measures proposed in this EMPr be adopted and be monitored by an independent person throughout the construction phase.

4. APPLICABLE LEGISLATION

Several laws and regulations apply to the protection of the environment and contain environmental principles and standards that need to be applied and permits and licences that need to be obtained. This EMPr will be subject to regulatory control under a range of State, Provincial and Local regulations. Such legislation largely embraces pollution prevention, resource use and conservation, and socio cultural (heritage) protection. This chapter reviews legislation pertaining to the proposed development.

According to Section 2 (1, 2 & 3) of the National Environmental Management Act No. 107 of 1998 (NEMA), all organs of state have to apply certain principles set out in NEMA when taking decisions that may significantly affect the environment. The key principles of this Act include that all “actions” that they approve must be economically, socially and environmentally sustainable. It further states that “people and their needs” must be at the forefront of “its concern” and their interests must be served equitably. The intent of this EMPr is to ensure that the developer conducts all its activities related to the operation and maintenance of this parking in accordance with the provisions of the NEMA, and has taken into account the provisions of the Constitution and the principles of Integrated Environmental Management.

Key environmental legislations that is applicable to the project are outlined below:

4.1 The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

The Constitution is the most important piece of legislation that provides a framework for environmental management in South Africa. There are various sections that have implications for environmental management, hence for sustainable development. The Bill of Rights is fundamental to the Constitution of South Africa and in, section 24 of the Act. Other sections in the Constitution that are of importance are section 32 which deals with

the right of access to information; section 33 which provides for just administrative action; section 38 which deals with the extended *locus standi* provisions.

National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended)

The National Environmental Management Act (Act 107 of 1998) generally known as “NEMA” is South Africa’s overarching framework for environmental legislation. The NEMA Act sets out the principles of Integrated Environmental Management (IEM). NEMA aims to promote sustainable development, with wide-ranging implications for national, provincial, and local government. Included amongst the key principles is that all development must be environmentally, economically and socially sustainable and that environmental management must place people and their needs at the forefront, and equitably serve their physical, developmental, psychological, cultural and social interest. Section 2 of NEMA, sets out a range of environmental principles that are to be applied by all organs of state when taking decisions that may significantly affect the environment. Section 24 (as amended), states that the activities that may significantly affect the environment and require authorisation or permission by law must be investigated and assessed prior to approval.

In terms of GNR 983 and GNR 985 of December 2014, a Basic Assessment process is required to be undertaken for the proposed project

Section 28 of NEMA creates a general duty of care on every person, and “person” is very widely defined, to take reasonable measures to prevent significant pollution or degradation of the environment from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

While no permitting requirements arise from this section of the Act, this will be applicable during construction in order to ensure minimisation of impacts on the environment.

National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004)

Provides management and conservation of South Africa’s biodiversity within the framework of the National Environmental Management Act 107 of 1998; the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

While no permitting requirements to this project. The developer will however be required implement proposed mitigation measures to prevent pollution of the identified sensitive area (wetland) on site from further degradation.

National Heritage Resources Act (Act No 25 of 1999)

Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including:

- the construction of a bridge or similar structure exceeding 50 m in length.

The existing Bridge will be widened by 30 m in length, however it is older than 60 years and therefore enjoys general protection under the National Heritage Act. A permit would be required to be obtained from Gauteng PHRA. A Heritage Assessment has been undertaken as part of this Basic Assessment (refer to Appendix G).

The National Environmental Management Waste Act 2008 (Act 59 of 2008)

The National Environmental Management Waste Act (NEMWA) reforms the law regulating waste management in order to protect health and the environment providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

No waste license activities are applicable to this project. The developer will however be required to store and manage waste in accordance with the requirements of this Act and associated Standards.

The Occupational Health and Safety Act 1993 (No 85 of 1993)

The Occupational Health and Safety Act make provision in regulation Section 8 for the general duties of employers to their employees. Section 9 of the Regulations makes provision for general duties of employers and self employed persons to persons other than their employees.

While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. Healthy and safety precautions measures must be put in place for the construction crew and the public

The National Environmental Management: Air Quality Act 2004 (No 39 of 2004)

National Environmental Management: Air Quality Act (NEM: AQA) which provides for the control of dust, noise and offensive odours.

While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan.

The National Environmental Management: Water Act, 1998 (Act No. 36 of 1998)

The National Water Act aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled.

Of specific importance to this application is Section 19 of the National Water Act, 1998 (Act No. 36 of 1998), which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring and must therefore comply with any prescribed waste standard or management practices.

In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.

In terms of Section 21, the project proponent will also need to apply for a water use licence.

Promotion of Access to Information Act, 2000 (Act No 2 of 2000):

Legislation that allows the public access to information about activities that influence their well-being and to make contributions to decision making.

No permitting is required the act finds applicability during the public participation process phase of the basic assessment process.

5. PHASES OF THE PROJECT

The point of departure for this EMPr is to take a pro-active route by addressing potential problems before they occur. This should limit corrective measures needed during the construction and operational phases of the development. Additional mitigation will be included throughout the project's various phases, as required and if necessary.

The EMPr deals with the following phases as detailed below:

5.1. The Planning and Design Phase

Overall Goal for Planning and Design: Undertake the planning and design phase of the development in a way that:

- Ensures that the design of the plant responds to the identified environmental constraints and opportunities.

- Ensures that the best environmental options are selected for all components of the project.

The EMPr offers an ideal opportunity to incorporate pro-active environmental management measures with the goal of attaining sustainable development.

Pro-active environmental measures minimize the chance of impacts taking place during the construction and operational phase. There is still the chance of accidental impacts taking place; however, through the incorporation of contingency plans (e.g. this EMPr) during the planning phase, the necessary corrective action can be taken to further limit potential impacts. In order to meet this goal, actions plans for the planning and design phase have been identified together with monitoring requirements (refer to Table 1).

5.2. The Construction Phase

The bulk of the impacts during this phase will have immediate effect (e.g. noise-, dust- and wetland pollution). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the contingency plans identified in the planning phase, together with a commitment to sound environmental management from the developer.

5.3. Rehabilitation Phase

This phase will involve restoring the land impacted during the construction phase back to its original state or a state that conforms to the principles of sustainable development. This phase of the development will involve restoring the site and rectify the negative impacts that have been caused during construction by removing pollution or contaminants and other dangerous substances from the stream, sediment, or surface water and improvement of the soil. This will also involve the removal of all foreign material (e.g. structures, waste etc.) introduced on site once the construction phase is completed.

5.4. The Operational Phase

The proposed development will require very minimal maintenance during the operation phase. This can be once in 10 years, during this operation phase, the JRA roads and storm water operational plan will be used. Impacts of this development are more at the construction phase, even though mitigation measures have been provided during the maintenance of the facility impacts on the environmental are negligible. Nonetheless, by taking pro-active measures during the planning and construction phases, potential environmental impacts emanating during the operational phase will be minimised. This, in turn, will minimise the risk and reduce the monitoring effort, but it does not make monitoring obsolete.

6. ROLES AND RESPONSIBILITIES

The implementation of this EMPr requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during the construction phase. The stakeholders are discussed below.

6.1. Developer

- The developer remains ultimately responsible for ensuring that the development is implemented according to the requirements of the EMPr.
- Although the developer appoints specific role players to perform functions on his/her behalf, this responsibility is delegated.
- The developer is responsible for ensuring that sufficient resources (time, financial, human, equipment, etc.) are available to the other role players (e.g. the ECO, ELO and contractor) to efficiently perform their tasks in terms of the EMPr.
- The developer is liable for restoring the environment in the event of negligence leading to damage to the environment.
- The developer must ensure to appoint an independent Environmental Control Officer (ECO) to monitor and audit the implementation of the EMPr and environmental authorisation.
- The ECO must have the appropriate experience and qualifications to undertake the necessary tasks
- The developer must ensure that the EMPr is included in the tender documentation so that the contractor who is appointed is bound to the conditions of the EMPr.
- The developer must appoint an independent Environmental Control Officer (ECO) during the construction phase to oversee all the environmental aspects relating to the development.
- Submit an environmental audit report to the relevant competent authority (GDARD).

6.2. Contractor and Service Providers:

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- The contractor, as the developer's agent on site, is bound to the EMPr conditions through his/her contract with the developer, and is responsible for ensuring that he adheres to all the conditions of the EMPr.

- Thoroughly familiarise him/herself with the EMPr requirements before construction begins and must request clarification on any aspect of these documents, should they be unclear.
- Ensuring that he/she has provided sufficient budget for complying with all EMPr conditions at the tender stage.
- Ensuring adherence to the environmental management specifications.
- Ensuring that Method Statements are submitted to the Site Manager, and ECO, for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
- Ensuring that any instructions (whether verbal or written) issued by the site Manager, project manager or site engineer, ECO, in terms of the EMPr are adhered to.
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- Ensuring that incidents register is kept in the site office, which lists all transgressions issued by the ECO.
- Ensuring that a register of all public complaints is maintained.
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).
- He/she must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site.

6.3. The Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the developer as an independent monitor of the implementation of the EMPr. He/she must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site. The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMPr and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO is responsible for:

- Assisting in ensuring that the necessary environmental authorisations and permits have been obtained prior to construction commencing.
- Reviewing the Contractor's construction Method Statements.
- Monthly site inspections of all construction areas with regard to compliance with the EMPr.
- Monitoring and verifying adherence to the EMPr, the EA and approved Method Statements at all times.

- Monitoring and verifying that environmental impacts are kept to a minimum.
- Taking appropriate action if the specifications are not followed.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel coming onto site.
- Advising on the removal of person(s) and/or equipment not complying with the specifications.
- Auditing the implementation of the EMPr and compliance with the EA on a monthly basis.
- Compiling a final audit report regarding the EMPr and its implementation during the construction period after completion of the contract and submitting this report to the Employer and the authorising authority.

The ECO has the right to enter the site and do monitoring and auditing at any time, subject to compliance with health and safety requirements applicable to the site (e.g. wearing of safety boots and protective head gear).

(a) Liaison with Authorities

The ECO will be responsible for liaising with the Gauteng Department of Agriculture and Rural Development (GDARD). The ECO must submit monthly environmental audit reports to the authorities. These audit reports must contain information on the contractor and developer's levels of compliance with the EMPr. The audit report must also include a description of the general state of the site, with specific reference to sensitive areas and areas of non-conformance. The ECO must indicate suggested corrective action measures to eliminate the cause of the non-conformance incidents. In order to keep a record of any impacts, an Environmental Log Sheet (refer to Appendix 1) is to be kept on a continual basis.

(b) Liaison with Contractors

The ECO is responsible for informing the contractors of any decisions that are taken concerning environmental management during the construction phase. This would also include informing the contractors of the necessary corrective actions to be taken.

6.4. Resident Engineer (RE)

The Resident Engineer (RE) will be appointed by the 'Consultant' and will be required to oversee the construction programme and construction activities performed by the Contractor. The RE is expected to liaise with the Contractor and ECO on environmental matters, as well as any pertinent engineering matters where these may have environmental consequences. He/she will oversee the general compliance of the Contractor with the EMPr and other pertinent site specifications. The RE will also be required to be familiar with the EMPr specifications and further monitor the

Contractor's compliance with the Environmental Specifications on a daily basis, through the Site Diary, and enforce compliance.

6.5. Environmental Liaison Officer (ELO)

The contractor must appoint an Environmental Liaison Officer (ELO) to assist with day-to-day monitoring of the construction activities. Any issues raised by the ECO will be routed to the ELO for the contractors' attention. The ELO shall be permanently on site during the construction phase to oversee the Contractor's internal compliance with the EMPr requirements and ensuring that the environmental specifications are adhered to. The ELO should ideally also be a senior and respected member of the construction crew.

The ELO will be responsible for keeping detailed records of all site activities that may pertain to the environment and include all these aspects in an environmental register. This register must be presented at each EMC meeting and be made available to the ECO during his/her monthly audits. In addition to the environmental register the ELO must keep a register of complaints from any community members on environmental issues. Finally, the ELO will be required to keep a record of all on-site environmentally related incidents and how these incidents were dealt with. Past experience has revealed that, ELO's that can relate to the work force are the most effective for information transfer and ensuring compliance with the EMPr.

7. ENVIRONMENTAL MANAGEMENT PROGRAM (EMPr)

The following table forms the core of this EMPr for the construction and operational phases of the development. This table should be used as a checklist on site, especially during the construction phase. Compliance with this EMPr must be audited monthly during the construction phase and once immediately following completion of construction. This must be followed up with annual audits for a period of two years during the operational phase.

Table 1: Planning and Design Phase: Environmental Management Programme for the proposed project

Activity / issue	Action required	Responsible party	Frequency
Appointment and Duties of ECO	The Developer must appoint an independent Environmental Control Officer (ECO) who must monitor the contractor's compliance with the EMPr.	Developer	Once-Off
	The developer must provide the ECO and contractor with a copy of the EMPr.	Developer	Once-Off
	The priority of the ECO is to maintain the integrity of the development conditions outlined in the EMPr.	ECO	Continuous
	The ECO must form part of the project management team and attend all project meetings.	ECO	Continuous
	The contractor must ensure that the construction crew attend an environmental briefing and training session presented by the ECO prior to commencing activities on site.	ECO, Contractor	Once-Off
	Report on environmental compliance at the monthly site meetings	ECO, ELO	As necessary
	An Environmental Completion Statement will be prepared by the ECO for submission to JRA indicating completion of the project and compliance with the EMP and conditions. This statement will be prepared after the final audit during the rehabilitation phase.	ECO	Once-Off
Appointment and Duties of ELO	The contractor must appoint an Environmental Liaison Officer (ELO). This person will be required to monitor the situation with a direct hands-on approach, and ensure compliance and co-operation of all personnel. He should be fluent in the languages of the employees.	Contractor	Once-Off
EMPr	This EMPr must be made binding to the main contractor as well as individual contractors and should be included in tender	Developer, ECO	Once-Off

	documentation for the construction contract.		
Training for Site Personnel	All Contractor teams involved in construction work are to be required to undergo some form of environmental induction on their obligations towards environmental controls and methodologies in terms of this EMP, prior to commencing of the works.	Developer, ECO	Once-Off
	<p>The Contractor shall ensure that all site personnel have a basic level of environmental awareness training. Topics covered should include;</p> <ul style="list-style-type: none"> ▪ What is meant by “Environment” ▪ Why the environment needs to be protected and conserved ▪ How construction activities can impact on the environment ▪ What can be done to mitigate against such impacts ▪ Awareness of emergency and spills response provisions <p>- Social responsibility during construction of the bridge. It is the Contractor’s responsibility to provide the site foreman with environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.</p> <p>- Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary.</p> <p>- Use should be made of environmental awareness posters on site.</p> <p>- The need for a “clean site” policy also needs to be explained to the workers.</p> <p>- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.</p> <p>The Contractor must monitor the performance of construction</p>	Contractor	Continuous

	workers to ensure that the points relayed during their introduction have been properly understood and are being followed.		
	Environmental inductions may take the form of onsite talks and demonstrations by the Contractor and the ECO. Induction report will be signed by the Contractor as well as the Employee undergoing Induction, and records kept for auditing purposes and copies given to the ECO for filing. The education / awareness programme should be aimed at all levels of management and staff within the Contractor's team, and particularly labour drawn from surrounding communities	ELO, ECO, Contractor	Continuous
Record Keeping	It is recommended that photographs are taken of the site prior to, during and immediately after construction as a visual reference. These photographs should be stored with related documents and other records related to this EMPr.	Developer, Contractor	As necessary
	<ul style="list-style-type: none"> ▪ All specialists reports (Heritage Impact Assessment and Wetland Delineation and Rehabilitation and Monitoring Plan) ▪ EMPr ▪ Records must be kept of those that have completed the relevant training. ▪ Records of attendance and the awareness talk subject must be kept on file. ▪ Records of public complaints (public register) ▪ Environmental authorisation and any other relevant project permits i.e. Water Use Licence and Heritage permit etc ▪ Waste Documentation ▪ ECO Site Audit/Monitoring Reports ▪ Method Statements etc. 	Developer, Contractor	Continuous

	<p>The Contractor shall ensure that all pertinent permits, certificates and permissions have been obtained prior to any activities commencing on site and ensure that they are strictly enforced / adhered to. This includes, for example, the Water Use License from the Department of Water and Sanitation DWS).</p>	<p>Contractor, Developer</p>	<p>Continuous</p>
	<p>All records related to the implementation of this management plan (e.g. site instruction book, ECO reports, induction records, method statements, must be kept together in an office where it is safe and can be retrieved easily.</p>	<p>Developer, Contractor, ELO</p>	<p>As necessary</p>
	<p>All relevant records should be kept for a minimum of two years after construction and should at any time be available for scrutiny by any relevant authorities or stakeholder.</p>	<p>Developer, Contractor</p>	<p>As necessary</p>
<p>Layout Designs</p>	<p>The planning process should ensure that the bridge is sufficiently wide to ensure diffuse water flow and that piped or concentrated water flow be avoided at all cost. Energy dissipaters downstream from the bridge should be applied should erosion resulting from high energy water flows become evident. Disturbance of the bed and banks of the Braamfontein Spruit will have to be carefully mitigated to minimize sedimentation and establishment of alien invasive plant species.</p>	<p>Developer, Contractor</p>	<p>As necessary</p>
	<p>The bridge (and any other related structure) should be constructed on a straight section of the stream, and not in a curve where either the natural eroding (outside bank) or sedimentation (inside) bank will put it under pressure, or where its failure might accelerate the natural erosion processes.</p>		
	<p>The bridge design should be able to accommodate large debris during flooding to prevent that the bridge gets blocked and washed away.</p>		
	<p>The bridge design should endeavour to span the riparian area with in channel wetland conditions and associated buffer zone, and</p>		

	should be outside the 1: 100 year flood line.		
	The bridge is older than 60 years and therefore enjoys general protection under the National Heritage Act. The bridge should be retained as is, where the above is unavoidable; any development at the bridge should be done in sympathy with the bridge in order to retain it for posterity This is subjected to authorization by means of a heritage permit.		
	<i>In terms of non-motorised (pedestrians, cyclists, etc.) facilities, there are existing walkways along Conrad Drive between Barkston Drive and Jan Smuts Avenue to facilitate movement of pedestrians, cyclists and other NMT users. During site visits there were a number of pedestrians observed along Conrad Drive.</i> The walkways must be retained in the new design	Developer, Contractor	Once - off
	Those areas surrounding the construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors.	Developer, ECO, Contractor	Continuous
Environmental Protection Plan	Within 21 days of the Commencement Date, the Site Contractor shall prepare and submit to the Project Manager for approval in consultation with the ECO an Environmental Protection Plan. The Plan shall cover all environmental protection works and shall also include descriptions of environmental safeguards and emergency procedures.	Developer, ECO, Contractor	Once - off
	The Plan shall include a description of the administrative structure and lines of communication which shall be established between the Contractor's and his subcontractors' workforce for the implementation of environmental protection procedures. Details of the expertise available for the implementation of environmental protection procedures must also be provided.	Contractor, RE, ECO	Once off
	In addition this plan must have a site layout plan and showing the	Contractor, RE, ECO	Once off

	<p>final positions and extent of all permanent and temporary site structures and infrastructure, including:</p> <ul style="list-style-type: none"> • Contractors' camp • Roads and access routes • Gates and fences. • Rubble and waste storage areas • Site toilets and ablutions. • Excavations and trenches. • Topsoil stockpiles. • Spoil areas. • Construction materials stores. • Vehicle and equipment stores. • Sensitive and No go areas & applicable buffers. This must include all areas of Environmental sensitivity (natural environment, sensitive habitats and wetland areas • All temporary and pollution management structures e.g. bunds and sumps (where applicable) 		
Existing Services and Infrastructure	The Contractor shall ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the RE.	Contractor, RE, ECO	Continuous
	The Contractor shall be responsible for the repair and reinstatement of any existing infrastructure that is damaged or services which are interrupted.	Contractor	As necessary
	Such repair or reinstatement will be to the Contractor's cost and shall receive top priority over all other activities.	Contractor	Continuous
	A time limit for the repairs may be stipulated by the RE in consultation with the Contractor.	Contractor, RE, ECO	Continuous

<p>Emergency Preparedness</p>	<p>If chemicals in sufficient quantity and toxicity have the potential to be released on the construction sites, emergency contingency plans should be prepared as safety measures (Bunded areas). These safety measures should be communicated to the relevant personnel on the construction site. All hazardous installations require a Risk Assessment in terms of the Occupational Health and Safety Act, (Act No.85 of 1993) for construction sites.</p>	<p>Contractor, ELO</p>	<p>Once - Off</p>
<p>Method Statements</p>	<p>The Contractor shall submit written Method Statements to the RE for the activities identified by the RE or ECO. Activities that will require method statements include:</p> <ul style="list-style-type: none"> • Logistics for the Environmental Awareness Training Course • Location and Layout of Construction camp • Construction procedures • Solid and Hazardous Waste Management • Drainage and Storm water planning • Dust Control • Stockpiling area • Vegetation removal • Materials and equipment to be used • Getting the equipment to and from the site • How the equipment material will be moved while on site • How and where material will be stored • The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur • Timing and location of activities • Compliance/non compliance with Specifications 	<p>Contractor</p>	<p>As necessary</p>

<p>Method Statements</p>	<ul style="list-style-type: none"> • Site camp establishment • Concrete pre-cast and batching operation (if required) • Emergency procedures • Materials, equipment and staffing requirements • Transporting the materials and/or equipment to, from and within the site • Stockpiling of rubble • General and Hazardous waste management on site • The storage provisions for the materials and/or equipment • The proposed construction procedure designed to implement the relevant Environmental Specifications • Other information deemed necessary by the RE and/or ECO. <p>Method Statements shall be submitted at least ten working days prior to the proposed commencement of work on an activity to allow the RE (and/or ECO) time to study and approve the method statement.</p>		
	<p>Contractor shall not commence work on that activity until such time as the Method Statement has been approved in writing by the RE contract.</p>	<p>Contractor, RE, ECO</p>	<p>Continuous</p>
	<p>The Contractor shall carry out the activities in accordance with the approved Method Statement.</p>	<p>Contractor, RE, ECO</p>	<p>Continuous</p>
	<p>Under certain circumstances, the RE may require changes to an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor and the RE, and appropriate records retained.</p>	<p>Contractor, RE</p>	<p>Continuous</p>
	<p>Approved Method Statements shall be readily available on the site</p>	<p>Contractor, Developer</p>	<p>Continuous</p>

	and shall be communicated to all relevant personnel. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the EMPr specifications.		
Site Establishment	The contractor shall establish his construction camp, office/s and any other infrastructure as per the agreed site layout plan in a manner that does not adversely affect the environment.	Contractor, ECO	Once-Off
	The contractor shall submit a method statement for site clearance for approval by the RE in consultation with the ECO. Site establishment shall take place in an orderly manner and all required amenities shall be installed at Camp site before the main workforce move onto site.	RE, Contractor, ECO	Once-Off
	The Construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction activities to the satisfaction of the Project Manager. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.	Contractor, ECO	Continuous
	Safe drinking water for human consumption shall be available at the site offices and at other convenient locations on site. All water used on site must be taken from a legal source and comply with the recognised standards for potable and other uses.	Contractor, ECO	Continuous
	No fires on site will be allowed. Activities which may pose a risk of fire must be identified and suitable measures must be put in place to prevent any possible damage by fire. Contractors must inform the staff of the risk of fires and fire prevention and emergency procedures in the event of a fire. Fire fighting equipment shall be supplied by the Contractor at suitable locations	Contractor, ECO	Continuous
	The construction camp must preferably be positioned where it will not visually impact on adjacent landowners and should not be located in	Contractor, ECO	Once off

	an environmentally sensitive area		
	All sensitive areas, heritage (if encountered), wetland, drainage lines , should be demarcated and fenced off before development commences. These areas should be treated as “no go” areas. Activities in the wetland should only be limited to those areas authorised.	Contractor, ECO, ELO	Continuous
	Invasive alien plant species should be treated in an appropriate manner.	ELO and Contractor	Continuous
	Alien plant eradication and follow-up control activities prior to construction, to prevent spread into disturbed soils, as well as follow-up control during construction.	ELO and Contractor	Continuous

Table 2: Pre - Construction Phase: Environmental Management Programme for the proposed project

Activity / issue	Action required	Responsible party	Frequency
	Locate and clearly indicate convenient access routes, temporary loading and packing areas and turning circles so that vehicle movement can be confined to these areas	ELO, Contractor	Continuous
	Locate chemical toilets so that they are easily accessible for servicing	ELO, Contractor	Continuous
	Direct lights so that they do not pose a nuisance to neighbours	ELO, Contractor	Continuous
	Locate temporary waste bins and skips so that they are easily accessible for removal	ELO, Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Those areas surrounding the construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors.	Developer, Contractor	ECO, Continuous
Changing the physical structure within a water resource	Avoid activities within the delineated wetland and associated buffer zone. Only authorised activities are to be undertaken e.g. Bridge expansion	Contractor	Continuous
	Project engineers should compile a method statement, outlining the construction methodologies. The required mitigation measures to limit the impacts on the watercourse and associated buffers should be contained within the method statement. The method statement must be approved by the ECO and be available on site for reference purposes	Project Engineer	As necessary
	Plan construction activities to have the smallest possible footprint	Developer, Engineers	Project Once off
	Demarcate the construction footprint prior to commencement of construction and ensure that all workers and contractors are aware that access beyond the demarcated areas is not allowed. Where the structures will affect a wetland, the edge / boundary of this wetland must be clearly demarcated in the field with poles, sticks, or any solid structure that will last for the duration of the development. These indicators could be coloured as follows and communicated to workers Red – Indicating the edge / boundary of the wetland Orange – Indicating the edge of the buffer zone	Contractor, ECO, ELO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Ensure that copies of the Wetland and Rehabilitation Reports and other applicable documents are available on site and that all workers and contractors are aware of it. Implementation thereof should be monitored by the appointed the site Safety and Environmental Officer (SHE) or independent Environmental Control officer (ECO)	Contractor, Developer, ELO	Continuous
	Plan construction activities that necessitate construction within the wetland to only cross the wetland at approved designated points as per designs	Developer	Once - off

Table 3: Construction Phase: Environmental Management Programme for the proposed project

Activity / issue	Action required	Responsible party	Frequency
Prevention of pollution on wetland	If concrete batching will be required on site. The contractors must provide and maintain a method statement for “cement and concrete batching”. The method statement must provide information on proposed location, storage, washing & disposal of cement, packaging, tools and plant storage	Contractor, RE ECO	Once off
	Cement, asphalt and plaster should only be mixed within mixing trays. Washing and cleaning of equipment should also be done within a bermed area (outside of the wetland buffer), in order to trap any cement, asphalt or plaster and avoid excessive soil erosion. These sites must be rehabilitated prior to commencing the operational phase	Contractor, ELO, ECO	As necessary
	Where access cannot be avoided into sensitive areas (wetland), the amount of vehicle and personnel traffic should be kept to a minimum and should make use of only one route	Contractor, ELO, ECO	As necessary
	Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas. These substances must be confined to specific and secured areas within the contractor’s camp, and in a way that does not pose a danger of pollution even during times of high rainfall	Contractor, ELO, ECO	Continuous
	Storage of materials as described above may not be within the 1:100 floodline, watercourses or associated buffer areas	Contractor, ELO, ECO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	No vehicles will be allowed within the 30m buffer of sensitive environments (wetland, drainage lines).	Contractor, ELO, ECO	Continuous
	In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water and Sanitation (DWS) must be informed immediately	Contractor, ELO	As necessary
	No hydrocarbon spillages and dirty water from site must not be allowed to flow into the watercourse.	Contractor, ELO, ECO	Continuous
	All equipment should be parked overnight and/or fuelled at least 30 meters from the wetland	Contractor, ELO	As necessary
	Spill kits must be available on site for the cleanup of any hydrocarbon spillages		
	Drip trays (minimum of 10cm deep) must be placed under all leaking vehicles and machinery under repair and maintenance. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised	Contractor, ELO, ECO	Continuous
	Construction vehicles are to be maintained in good working order so as to reduce the probability of leakage of fuels and lubricants	Contractor, ELO, ECO	Continuous
	Provision of adequate sanitation facilities located outside of the wetland/riparian area or its associated buffer zone	Contractor, ELO, ECO	Continuous
	Remove all construction equipment and material on completion of construction	Contractor, ELO	Once off

Activity / issue	Action required	Responsible party	Frequency
Wetland Degradation	Where any hard structures (concrete, gabion or otherwise) are used, it should be well keyed into the surrounding bank walls and secured to the ground.	Contractor, ELO	As necessary
	Construction in and around watercourses must be restricted to the dryer winter months.	Contractor, ELO	As necessary
	A temporary fence or demarcation must be erected around the works area to prevent access to sensitive environs.	Contractor, ELO, ECO	Continuous
	Prevent pedestrian and vehicular access into the wetland and buffer areas as well as riparian areas.	Contractor, ELO, ECO	Continuous
	Consider the various methods of construction and take cognisance of that which will have the least impact on watercourses	Contractor, ELO, ECO	Once off
	No activities should take place in the watercourses and associated buffer zone. Where the above is unavoidable, only the footprint of the Bridge should be considered. This is subjected to authorization by means of a water use license.	Once off	Once off
Environmental incidents	The contractor must take corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves	Contractor , ELO,	Continuous
Handling and Storage of	Materials storage areas will not be allowed in close proximity to ecologically sensitive areas (wetland on site)	Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
Hydrocarbons	Storage of potentially hazardous materials should be above any 100-year flood line or the functional wetland boundary (and its associated buffer zone). These materials include fuel, oil, cement, bitumen etc.	Contractor, ECO	Continuous
	Spill kits must be available on site for the clean-up of any hydrocarbon spillages	Contractor, ECO	Continuous
	The areas around fuel tanks are to be bunded in accordance with SANS 1089:1999: Part 1	ELO, Contractor	Once off
	Hazardous chemicals or potentially hazardous chemicals used during construction shall be stored in secondary containers and all relevant Material Safety Data Sheets (MSDSs) shall be available on site	Contractor	Continuous
	<ul style="list-style-type: none"> ▪ Concrete is to be mixed on mixing trays only, not on exposed soil; ▪ Concrete and tar shall be mixed only in areas which have been specially demarcated for this purpose; ▪ After all the concrete / tar mixing is complete all waste concrete / tar shall be removed from the batching area and disposed of at an approved dumpsite; 	Contractor, ELO	As necessary
	The relevant emergency procedures relevant to particular chemicals used on site, as per the MSDSs and suppliers guidelines, will be followed in the event of an emergency	Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	The contractor shall prevent discharge of any pollutants such as cement, asphalt, concrete, lime, chemicals, fuels and oils into any water sources and adequate storm water control measures will be implemented where these substances are handled	Contractor	Continuous
Handling and disposal of contaminated water	No discharge of pollutants such as cement, concrete, lime, chemicals, fuels or oils will be allowed into any water resource	ELO, Contractor	Continuous
	Surface water draining off contaminated areas containing carbon fuels (e.g. oils, diesel etc.) would need to be channelled towards a sump which will separate these chemicals and oils;	Contractor	Continuous
	Only above ground temporary storage tanks will be allowed on site	ELO, Contractor	Continuous
	Contaminated or potentially contaminated water should not be discharged into the watercourse on site	ELO, Contractor	Continuous
Lighting	Working hours shall generally be restricted to daylight hours	ELO, Contractor	Continuous
	If working hours are required outside of daylight hours, the contractor shall provide notification by completing the Night work Application three days in advance of the work taking place.	ELO, Contractor	Continuous
	Security lights shall be directed from the perimeter wall towards the centre of the camp with a down angle	ELO, Contractor	Continuous
Waste management	Litter generated by the construction crew must be collected in rubbish bins and disposed of weekly at registered waste disposal sites.	ELO, Contractor	Weekly
	All building rubble, solid and liquid waste etc must be disposed of as necessary at an appropriately licensed refuse facility.	ELO, Contractor	Once off, as necessary

Activity / issue	Action required	Responsible party	Frequency
	Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires will be allowed on site.	ELO, Contractor	Monitor daily
	The construction site must be kept in a clean and orderly state at all times.	Contractor, Construction crew	Monitor daily
	No waste may be dumped into the wetland on site	ELO, Contractor, ECO	As necessary
	No burning of waste will be allowed on site	ELO, Contractor	Monitor daily
	All related documents for disposal of general and hazardous waste are to retained on site to be included in the end of project documents.	Contractor, ELO, ECO	Continuous
	Empty containers in which hazardous substances were kept are to be treated as hazardous waste	ELO, Contractor, ECO	As necessary
	Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project are disposed of an approved at dumping site as approved by the Council.	ELO, Contractor	Monitor daily - weekly
Storm water Management	No stockpiles or construction materials may be stored or placed within any drainage line that may be in close proximity of storm water drains	Contractor, ELO, ECO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Should a freak storm displace the temporary earth embankments or other erosion control structures, a visual inspection of the site must be made and any damage be recorded. Any damage and loss of soil resulting from a storm is to be remedied immediately. Should the temporary walls collapse due to construction error, the contractor is to fund the remediation process	Contractor, ELO, ECO	Continuous
	Storm water at the construction crew camp must be managed so as to reduce the silt loads into the ecological environment. Measures must be implemented to distribute storm water as evenly as possible to avoid point sources of erosion	Contractor, ELO, ECO	Continuous
	The site must be managed in a manner that prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemicals	Contractor, ELO, ECO	Continuous
	No stockpiles or construction materials may be stored or placed in close proximity to storm water drains.	Contractor, ELO, ECO	Continuous
	Temporary cut-off drains and berms may be required to capture storm water and promote infiltration.	Contractor, ELO, ECO	Continuous
Noise management	Construction and the use of construction machinery should be limited between 06h00 and 18h00 on weekdays only.	Developer, Contractor	Monitor daily
	Institute noise control measures throughout the construction phase for all applicable activities, including the construction times.	ELO, Contractor	Once off, as necessary
	Unnecessary honking of construction vehicles should not be allowed on site.	ECO, ELO, Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Inform residents of nearby residential areas of planned noisy activities outside the timeframes stated above.	ECO, ELO, Contractor	Once off, as necessary
	No construction should occur during weekends, unless the adjacent residents have been notified in writing at least three days in advance.	ELO, Contractor	Once off, as necessary
	Construction activities must abide by the national noise laws and the municipal noise by-laws with regard to the abatement of noise caused by mechanical equipment.	Developer, ELO, Contractor	Continuous
Air Pollution	Wet all unprotected cleared areas and stockpiles with water to suppress dust pollution during dry and windy periods.	ECO, ELO	As necessary
	All forms of dust/air pollution must be managed in terms of the NEMA Air Quality Act (AQA) 2004, (Act 39 of 2004); this includes the control of noxious and offensive gases, smoke, dust and vehicular emissions. Under no circumstances may toxic pollutants of high concentration be released into the air.	ECO, ELO	As necessary
	Burning of vegetation including tree trunks and stumps cut during site clearing and establishment shall not be permitted. Woody material should be chipped and reused as mulch back on the site.	Contractor, ELO	As necessary
	Ensure proper rehabilitation of disturbed areas in order to minimise bare patches that can be a source of fugitive dust.	ELO, Contractor	Continuous
Crime, safety and security	Ensure that the construction vehicles are under the control of competent personnel and are in proper working order.	Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Ensure that only suitably qualified personnel use construction vehicles	Contractors	Continuous
	Ensure that the contact details of the police or security company and ambulance services are available on site	Contractor	Continuous
	Limit access to the construction crew camp to construction workers through access control.	ELO, Contractor	Continuous
	Comply with the requirements of the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) requirements.	ELO, Contractor	Continuous
	Ensure that the handling of equipment and materials is supervised and adequately instructed.	ELO, Contractor	Continuous
	Vehicular traffic during construction activities must be limited to a maximum speed limit of 60 km/hr.	ELO, Contractor	Continuous
Crime, safety and security	If blasting is required, site notices informing the public of the planned activities must be placed at visible locations a few days prior to any blasting.	ELO, Contractor	As necessary
	The security fence around the development site must be completed before construction commences internally.	ELO, Contractor	Once-off
	Security fence is to be inspected daily to ensure no illegal entry points are created.	ELO, Contractor	Daily
	The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the National Building Regulations.	Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	The contractor must supply his own security arrangements for the construction camp within the framework of the EMPr.	Contractor, ELO	Continuous
	Equipment and materials must be handled by staff that have been supervised and adequately trained.	Contractor, ELO	Continuous
	Staff must be regularly updated about the safety procedures.	Contractor, ELO	Continuous
	Emergency facilities must be available and adequately supplied for use by staff and customers.	Contractor, ELO	Continuous
	Ensure that the handling of equipments and materials is supervised and adequately instructed.	Contractor, ELO	Continuous
	Limit access to the construction crew camp only to the workforce.	Contractor, ELO	Continuous
	Any crimes to be reported to the local South African Police Service (SAPS). These incidents are either reported by the PM or through the knowledge of the PM.	Contractor, ELO	Continuous
	<ul style="list-style-type: none"> ▪ All employees to be clearly identifiable. ▪ Proper supervision of employees at all times. ▪ Construction activities must remain within construction footprint. ▪ No unauthorized people to be allowed on site. 	Contractor, ELO	Monitor daily
	Appropriate notification signs must be erected, warning the residents, pedestrians and cyclist about the hazards around the construction site and presence of heavy vehicles	Contractor, ELO	Once-off, or as necessary

Activity / issue	Action required	Responsible party	Frequency
Stripping of vegetation	The working strip must be effectively monitored to prevent excessive vegetation removal. By maintaining the maximum amount of stabilising vegetation, the extent of erosive action will be contained.	ELO, Contractor	Continuous
	Re-vegetation must be on-going and relevant to terrestrial, wetness zone and slope	ELO, Contractor	Continuous
	Where possible, remove vegetation as sods that can be replanted as part of the rehabilitation of vegetation around the conduit footprint. Store sods in already cleared areas or degraded areas and water at least once week	ELO, Contractor	As necessary
	Stripping of vegetation for construction must occur in a phased manner and must be restricted to the construction footprint to reduce the risk of erosion during times of precipitation	ELO, Contractor	As necessary
	Limit the removal of naturally occurring vegetation to only that which is absolutely necessary	ELO, Contractor	Once off, as necessary
	Vegetation to be retained during the construction phase must be clearly demarcated with danger tape.	ELO, Contractor	Once off, as necessary
	Where activities occur in areas that slope towards wetlands, the slopes must be re-vegetated by either using removed sods or by seeding with a grass mixture containing species naturally occurring in the area. Sloped areas where vegetation has been removed or destroyed should be replanted immediately after the initial disturbance to reduce the potential of erosion or invasion of the disturbed soils by alien invasive plant species	ELO, Contractor	Immediately after installation of culverts

Activity / issue	Action required	Responsible party	Frequency
	Indigenous hydrophytes (e.g. reeds) should be established on the banks of the river as this could help stabilise the banks and limit sedimentation.	ELO, Contractor	Once off, as necessary
Stripping vegetation of	Where possible, cut vegetation to ground-level rather than removing completely, to ensure rapid re-colonisation (Teixeira-Leite, 2009)	Contractor, ELO, ECO	As necessary
	Limit the removal of naturally occurring vegetation to only that which is absolutely necessary	Contractor, ELO, ECO	As necessary
	Where earthworks will take place in riparian areas areas: Naturally occurring indigenous riparian plant species (e.g. Typha capensis, Schoenoplectus sp., Cyperus congestus and grasses such as Imperata cylindrica, Leersia hexandra, Phragmites australis) must be identified prior to construction and shall be <ul style="list-style-type: none"> ▪ Removed appropriately with their root ball intact. riparian vegetation removed shall be stockpiled neatly on the periphery of the area being stripped, for use in wetland rehabilitation (Teixeira-Leite, 2009) 	Contractor, ELO, ECO	As necessary
	All rehabilitated areas must be monitored for the presence of exotic and alien plant species during rehabilitation		
Excavation	Topsoil and subsoil must be placed on opposite sides of the trench and must be kept separate throughout construction and rehabilitation	Contractor, ELO, ECO	As necessary

Activity / issue	Action required	Responsible party	Frequency
	Topsoil must not be stockpiled for an extensive period (> 3 months). This is to prevent the redundancy of the existing seed bank as well as the alteration of the soil characteristics (permeability, bulk density etc.).	ELO, ECO, Contractor	As necessary
	Erect signs and/or danger tape around the exposed excavations to warn the public of the inherent dangers.	ELO, Contractor	Continuous
	Ensure that excavated and stockpiled soil material is stored and bermed on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate.	ECO, Contractor	As necessary
Stockpiling soil	It is imperative that this soil be collected and stored to ensure that valuable seeds in the soil are not lost to the process of eventual rehabilitation of the site.	ELO, Contractor	As necessary
	Disturbance of topsoil on construction sites with severe slopes should be minimised at all costs.	ELO, Contractor	As necessary
	The areas where excavated soil will be stockpiled must be bordered by berms to prevent soil loss caused by rain.	ELO, Contractor	As necessary
	Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences.	ELO, Contractor	As necessary
	Soil shall be stripped to a minimum depth of 300 mm or to the depth of bedrock where soil is shallower than 300 mm	ELO, Contractor	As necessary
	Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.	ELO, Contractor	As necessary

Activity / issue	Action required	Responsible party	Frequency
	Position topsoil stockpiles away from the watercourse and drainage lines	ELO, Contactor	As necessary
	When possible and space allows: Stockpiled soil (particularly topsoil) must be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season (this will prevent topsoil being leached of its nutrient content and/or being washed away or mixed with other stockpiled soil).	ELO, Contactor	As necessary
	The topsoil will be stored in such a way and at such a place that it will not cause damming up of water or wash away itself	ELO, Contactor	As necessary
	<p>If topsoil is to be stockpiled for extended periods, especially during the wet season, then the ECO may recommend one of the following measures:</p> <ul style="list-style-type: none"> ▪ The covering of the stockpiles with a protective material such as hessian mats. ▪ Seeded with a temporary grass to keep the microbial activity within the soil alive. 	ELO, Contactor	As necessary
	Soil stockpiles shall not be higher than 1,5m and the slopes of soil stockpiles shall not have a vertical/horizontal gradient exceeding 1: 1,5.	ELO, Contactor	As necessary
	Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation	ELO, Contactor	As necessary
	The stockpiled topsoil must be replaced as the final soil layer.	ELO, Contactor	As necessary

Activity / issue	Action required	Responsible party	Frequency
	Vehicle access onto the topsoil must be strictly prohibited once it has been prepared as per above for seeding to take place and up until the grass has germinated and become established.	ELO, Contactor	As necessary
	Topsoil placement shall be done concurrent with construction as soon as construction in an area has ceased. After topsoil placement is complete, stockpiled vegetative matter may be spread randomly by hand over the top soiled area which may serve as mulch.	ELO, Contactor	As necessary
Destruction of heritage resources	Should any archaeological artefacts be exposed during excavation, work on the area where the artefacts were found, shall cease immediately and the ECO shall be notified as soon as possible.	ELO, Contractor	As necessary
	Upon receipt of such notification, the ECO will arrange for the excavation to be examined by an Archaeologist as soon as possible	ECO, Contractor	As necessary
	A heritage permit should be obtained for modifying the bridge	Developer/contractor	Once off
	Under no circumstances shall archaeological artefacts be removed, destroyed or interfered	ELO, Contractor	Continuous
	Any archaeological sites exposed during construction activities may not be disturbed prior to authorisation by the South African Heritage Resources Agency	ECO, Contractor	As necessary
Aesthetic / visual	Prevent unnecessary removal of vegetation outside the width of the working area by clearly demarcating the working area	ELO, Contractor	Continuous
	Remove spoil material from the area once the trench has been filled	Contractor	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Remove vegetation and topsoil and stockpile separately from subsoil prior to excavation of the cable trench.	ELO, Contractor	Continuous
	Revegetate disturbed ground in the working area by seeding and spreading of vegetation that has been removed from the trench at the start of construction.	ELO, Contractor	Continuous
Traffic impact	Access to the site must follow current and established routes. The contractor should be responsible for any damage caused to the road or road curb/verges.	Contractor	Continuous
	The Contractor shall comply with all legislation with regard to man-made facilities and activities in the area, including the Occupational Health and Safety Act (Act 85 of 1993).	Contractor	Continuous
	It must be ensured that a backlog of traffic does not develop on site during peak hours, through the erection of signage to warn motorist of construction, closed road lanes, traffic delays etc.	Contractor	Continuous
	Prior to construction informative hazard Warning Signage must be erected to inform public of the inherent dangers;	Contractor, ELO	Continuous
	During day time, designate responsibility to some construction crew to guide traffic (traffic controllers) during construction to motorist that will be affected during construction.	Contractor, ELO	Continuous
	During night time, traffic warning signs must be erected to guide traffic after construction working hours.		

Activity / issue	Action required	Responsible party	Frequency
Prevent/limit sedimentation	Cause of sedimentation should be identified and dealt with appropriately	Contractor, ELO	Continuous
	Should water need to be pumped around the works area and discharged back into the river, care must be taken to ensure that the water is discharged in a manner that does not cause siltation or erosion downstream. As such it is recommended that any water to be discharged from pumping around the construction area or from dewatering operations be first discharged into a structure that allows the settlement of all suspended material, and which allows the diffuse discharge of water into the river. The water must be dissipated on re-entry into the watercourse, to reduce the changes of erosion	Contractor, ELO	Continuous
	The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter watercourses. Appropriate measures, e.g. erection of silt traps, or drainage retention areas to prevent silt and sand entering drainage or watercourses must be taken	Contractor, ELO	Continuous
	Silt trenches between the works area and downstream riparian area could be used to trap any sediment washing off the works area and to prevent scouring of the stream line in case of heavy flows. This will provide protection for the downstream section of the watercourse for almost the entire length of road across a riparian area	Contractor, ELO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	Where wetlands or riparian areas are adjacent to the construction areas and these areas slopes toward the river, install sediment barriers along the edge of the construction areas as necessary to prevent sediment flow into the river	Contractor, ELO	Continuous
	Sediment barriers must be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or restoration of adjacent upland areas is complete	Contractor, ELO	Continuous
	It is important that topsoil should be conserved in areas where bedrock is shallow to avoid sedimentation	Contractor, ELO	Continuous
	Should water need to be pumped around the works area and discharged back into the stream, care must be taken to ensure that the water is discharged in a manner that does not cause siltation or erosion downstream. As such it is recommended that any water to be discharged from pumping around the construction area or from dewatering operations be first discharged into a structure that allows the settlement of all suspended material, and which allows the diffuse discharge of water into the stream. The water must be dissipated on re-entry into the watercourse, to reduce the changes of erosion	Contractor, ELO	As necessary
Preventing spread of alien invasive species	Appointment of alien plant working group / assign this duty to specific staff		

Activity / issue	Action required	Responsible party	Frequency
	<ul style="list-style-type: none"> ▪ If herbicide must be used it should be registered for aquatic use. ▪ Manual removal methods are preferred to chemical control ▪ Acquire the necessary equipment for removal and control ▪ Planned sequence of areas to be cleared of invasive plants 		
	<ul style="list-style-type: none"> ▪ A register of the methods used, dates undertaken, as well as herbicides and dosage used must be kept and available on site. The register must also include incidents of poisoning or spillage ▪ Ensure that contractors can identify the relevant plants and are aware of the removal procedures 		
	Construction equipment must be cleaned prior to site access. This will prevent alien invasive seed from other sites to spread into disturbed soils		
	Alien invasive species that are identified within servitudes should be removed prior to construction related soil disturbances. This will prevent seed spreading into disturbed soils		
Limit Exposure to Erosion	Erosion control of all banks must take place so as to reduce erosion and sedimentation into river channels or wetland areas.	Contractor, ELO	Continuous
	Should sedimentation be observed to accumulate and smother vegetation, a wetland specialist should be consulted to find a suitable solution for the specific wetland and its plant species composition.	Contractor, ELO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	The contractor shall be responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.	Contractor	During and immediately after Any construction
	Disturbances on site should be kept to a minimum to reduce the loss of material by erosion	Contractor	Continuous
Completion of Construction	The ECO must ensure that all construction equipment and all foreign material are removed on completion of construction	Developer	As necessary
	On completion of construction activities, monitoring should be done in order to record compliance with the targets set out in the EMP and to highlight any areas where further action are required in terms of rehabilitation or routine monitoring (refer to monitoring plan)	Developer	As necessary

Table 4: Operational Phase: Environmental Management Programme for the proposed project

Activity / issue	Action required	Responsible party	Frequency
Pollution of the wetland	During maintenance, activities should be limited to the areas where maintenance has to be undertaken.	Developer	Continuous
	In the event that maintenance must be carried out, all equipment should be parked overnight and/or fuelled at least 30 meters from the wetland	Developer	As necessary
	Storage of maintenance materials / chemicals may not be within the 30m of wetland or associated buffer areas	Developer	As necessary
	The SHE must ensure that all maintenance equipment and material are removed on completion of maintenance	Developer	As necessary
	Removal of vegetation during maintenance should be limited to the area of operation only.	Developer	As necessary
Preventing spread of alien invasive	<p>If establishment of alien invasive plant species in rehabilitated areas or in watercourses occurs. The following must be undertaken:</p> <ul style="list-style-type: none"> ▪ Remove emergent invasive vegetation from the servitudes as <ul style="list-style-type: none"> ○ well as rehabilitated footprint as soon as it becomes apparent ▪ Manual labour is preferred above chemical or manual removal. ▪ Do not use herbicides or pesticides in or within 200 meters of <ul style="list-style-type: none"> ○ wetland areas 	Developer	Continuous

	<ul style="list-style-type: none"> ▪ Plan an alien invasive plant work group that can carry out follow-up alien plant control for at least three years after construction ▪ Ensure that contractors can identify the relevant plants and are aware of the removal procedures 		
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Table 5: Rehabilitation Phase: Environmental Management Programme for the proposed project

Activity / issue	Action required	Responsible party	Frequency
Establishment of Alien Plant species	If establishment of alien invasive plant species in rehabilitated areas or in watercourses occurs. The following must be undertaken: <ul style="list-style-type: none"> • Remove emergent invasive vegetation from the servitudes as well as rehabilitated footprint as soon as it becomes apparent • Manual labour is preferred above chemical or manual removal. • Do not use herbicides or pesticides in or within 200 meters of wetland areas 	Developer	Continuous
	Burning of vegetation including tree trunks and stumps cut during site clearing and establishment shall not be permitted. Woody material should be chipped and reused as mulch back on the site. No organic matter other than alien invasive material should leave the site. This will enable the environment to be rehabilitated easier.		

Activity / issue	Action required	Responsible party	Frequency
	<p>All rehabilitated areas must be monitored for the presence of exotic and alien plant species.</p> <ul style="list-style-type: none"> Should the presence of exotic/alien plant species be observed it should be removed appropriately 		
Mobilisation of pollutants	In case of emergencies or unforeseen events, problem must be remediated immediately and any spillage into any watercourses be reported to the Department of Water and Sanitation. In addition, the soil must be stabilised (import additional topsoil if necessary) and re-vegetated as soon as possible. Re-vegetation should include seeds from the adjacent grassland and any rescued protected plants and/or plants of conservation concern that might have been impacted upon by the emergency / unforeseen event	Contractor, ELO	As necessary
	Remove all project-related material used to support equipment on completion of construction	Contractor, ELO	Once off
	Any contaminated soil from the onsite needs to be removed and properly disposed off	Contractor, ELO,ECO	As necessary
	Materials such as fuel, oil, paint, herbicides and insecticides must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas	Contractor, ECO, ELO	Continuous
	These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall	ECO, Contractor, ELO	Continuous
	Storage of materials as described above may not be within the 1:100 floodline, watercourses or associated buffer areas	Contractor, ELO, ECO	Continuous

Activity / issue	Action required	Responsible party	Frequency
	In the case of significant pollution of the watercourse, the Regional Representative of the Department of Water Affairs (DWS) must be informed immediately	Contractor, ELO, ECO	As necessary
	All equipment should be parked overnight and/or fuelled at least 500 meters from a watercourse	Contractor, ELO	Continuous
	Drip trays (minimum of 10cm deep) must be placed under all leaking vehicles and machinery that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised.	Contractor, ELO, ECO	Continuous
	Drip trays must be utilised during repairs and maintenance of all machinery. The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle	Contractor, ELO	As necessary
	Provision of adequate sanitation facilities located outside of the wetland/riparian area or its associated buffer zone	Contractor, ELO	Continuous
	Any water discharged must comply with the relevant Water Quality limits/guidelines specified by Department of Water and Sanitation (DWS).	Contractor, ELO	As necessary

8. ENVIRONMENTAL AWARENESS PLAN

OBJECTIVE: Ensure all operation personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm (Environmental Awareness Plan)

To achieve effective environmental management, it is important that Contractors and site employees are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The developer is responsible for informing its employees and contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts

- Employees must have a basic understanding of the key environmental features of the site and its surrounding environment.
- Ensuring that a copy of the EMP is readily available on-site and that all site staff is aware of the location and has access to the document. Employees must be familiar with the requirements of the EMP and the environmental specifications as they apply to the operation of the facility.
- Ensuring that, prior to commencing any new site works, all employees have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Awareness of any other environmental matters, which are deemed to be necessary by the site manager.
- Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimise of disturbance to sensitive areas (wetland), management of waste and prevention of water pollution
- Records must be kept of those that have completed the relevant training.
- Training should be done either in a written or verbal format but must be in an appropriate format and language for the receiving audience
- Refresher sessions must be held to ensure the operating staffs are aware of their environmental obligations.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

8.1 Environmental Awareness Training

Environmental Awareness Training must be undertaken by the SHE Manager/Officer and must take the form of an on-site talk and demonstration by the the SHE Manager before the commencement of construction activities on site. A record of attendance of this training must be maintained by on site.

8.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations. Contractors or Engineers staff; site staff, sub-contractors or visitors to site.

This induction training should include discussing the developer's environmental policy and values, the function of the EMPr and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The reporting procedure must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE officer on site.

8.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least once a month) where the foreman/site supervision manager, environmental and safety representative and all employees on site hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

9. MONITORING PROGRAMME

Monitoring refers to the repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures. The monitoring plan aims to establish whether rehabilitation was successful, whether maintenance or related activities have impacts and whether the implementation of the proposed development has detrimental impacts on the riparian area after construction.

OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the environmental authorisation (once issued). Where this is not clearly dictated, JRA will determine and stipulate the frequency of monitoring required in consultation with the relevant authority. The contractor project manager will work with the site manager of the contractor to ensure that monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- Ensure adequate and appropriate interventions to address non-compliance.
- Ensure adequate and appropriate interventions to address environmental degradation.
- Provide a mechanism for the lodging and resolution of public complaints.
- Ensure appropriate and adequate record keeping related to environmental compliance.
- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- Aid communication and feedback to authorities and stakeholders.

9.1 Method of Monitoring

- Monitoring will be done as per the ECO monitoring protocol.
- The Contractor is deemed not to have complied with the Performance Specifications if:
 - There is evidence of willful or accidental contravention of any specification included in the Specification.
 - There is evidence of the contractor carrying out activities not permitted in terms of the Contract and / or the Specification.
 - There is evidence of environmental negligence and / or mismanagement resulting in negative impacts on the environment.
 - The contractor has failed to meet with the requirements of the approved schedule.

- A checklist of items, works and behaviors as outlined in the EMP, and conditions of the Environmental authorisation (EA) will be created that will be monitored.
- Non-compliance of the EMP and EA will be reported as per the ECO monitoring protocol
- The independent ECO will ensure compliance with the EMP, and will conduct monitoring activities. The ECO will undertake site inspections on a monthly basis or as specified in the environmental authorisation once issued. The ECO will report all non-compliances to the Site Manager and submit such reports to GDARD if specified in the environmental authorisation.

Please refer also to the rehabilitation and monitoring plan compiled for the project

9.2 Non Conformance Report

All supervisory staff and ECO must be provided a means to be able to submit a non conformance report to the site manager. The Non conformance report will describe in detail, the cause and effect of any environmental non-conformance by the contractor. Records of penalties may be required by the Authorities within 48 hours. The non conformance report will be updated upon completion of the corrective measures indicated on the finding sheet. The report must indicate that remediation measures have been implemented timeously and that the non-conformance can be closed out to the satisfaction of the site manager and ECO.

9.3 Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to GDARD as deemed practical or with the Final audit report. The report should include details of the activities undertaken in the reporting period, any non-conformances or incidences recorded, corrective action required and details of these non-conformances or incidents which have been closed out.

9.4 Internal Audits and Reporting

Internal audits must be undertaken by the developer. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMP. Findings of the audit must be made available to the external auditor.

9.5 Final Audit Report

A final environmental report must be compiled by the ECO and submitted to GDARD upon completion of construction and rehabilitation activities within 30 days of completion of construction phase (i.e. within 30 days of the site handover) and within 30 days of completion of rehabilitation activities). This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance of the environmental authorisation conditions) once issued and the requirements of the EMPr.

10. CONCLUSION

Provided this project is mitigated, as per the EMPr, the project will result in limited negative environmental impacts that can be mitigated through implementation of this EMPr. It is the applicant's responsibility to ensure that this EMPr is made binding on the contractor by including the EMPr in the contract documentation. The contractor should thoroughly familiarise himself with the requirements of the EMPr and appoint an environmental liaison officer (ELO) to oversee the implementation of the EMPr on a day-to-day basis.

Parties responsible for transgression of this EMPr should be held responsible for any rehabilitation that may need to be undertaken. Parties responsible for environmental degradation through irresponsible behaviour/negligence should receive penalties.

Key issues

- Construction should take place in **the dry season**, leaving enough time for the germination of seeds and revegetation of barren areas before the onset of the rainy season;
- Warning tape must be erected to inform public of the inherent dangers; and
- Regarding potential blasting activities that may be required on certain areas, it is important that the adjacent landowners are informed of these planned activities a few days in advance and that site notices informing the public are strategically placed at visible locations.

APPENDIX 1: INCIDENT AND ENVIRONMENTAL LOG

ENVIRONMENTAL INCIDENT LOG				
Date	Env. Condition	Comments <i>(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)</i>	Corrective Action Taken <i>(Give details and attach documentation as far as possible)</i>	Signature

