Environmental Management Programme

Eldorette Extension 54

Gaut 002/18-19/E0099

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TEXTURE
ENVIRONMENTAL CONSULTANTS











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GLOSSARY OF TERMS

ALIEN VEGETATION
Alien vegetation is defined as undesirable plant growth (usually of foreign origin) which includes, but is not limited to all declared category 1 and 2 listed invader species as set out in the 1983 Conservation of Agricultural Resources Act (CARA) regulations. Other vegetation deemed to be alien are those plant species that show the potential to occupy in number any area within the defined construction area and which are declared undesirable.

CONSTRUCTION MANAGER
The appointed person who acts as Construction Manager and is responsible for managing the construction process on site.

CONTRACTOR
A person or company appointed by the applicant to carry out stipulated activities.

EMERGENCY
An undesired event that results in a significant environmental impact and requires the notification of the relevant statutory body such as a local authority.

EMISSIONS
The release or discharge of a substance into the environment which generally refers to the release of gases or particulates into the air.

EMPr
Environmental Management Programme. A detailed plan of action prepared to ensure that recommendations for preventing the negative environmental impacts (and where possible improving the environment) are implemented during the life-cycle of a project.

ENVIRONMENT
In terms of the National Environmental Management Act 107 of 1998 (NEMA), "environment" means the surroundings within which humans exist and which are made up of:
the land, water and atmosphere of the earth;
micro-organisms, plant and animal life;
any part or combination of (i) of (ii) and the interrelationships among and between them; and
the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

ENVIRONMENTAL AUTHORISATION
An environmental authorisation or record of decision is a written statement from the Gauteng Department of Agriculture and Rural Development (GDARD) that records its approval of a planned undertaking to improve, upgrade or rehabilitate a development and the conditions of approval which may include mitigating measures required to prevent or reduce the effects of environmental impacts during the life of a contract.

ENVIRONMENTAL CONTROL OFFICER
A suitably qualified individual who on a regular basis monitors on behalf of the applicant the project compliance with conditions of the Environmental Authorisation (Record of Decision), environmental legislation and recommendations of this Environmental Management Programme.

ENVIRONMENTAL IMPACT
A change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

INCIDENT
An undesired event which may result in a significant environmental Impact but can be managed through internal response.

PROJECT MANAGER
The appointed person who acts as the manager of the project on behalf of the applicant.

SEMP
Strategic Environmental Management Plan. A SEMP (a sustainability framework) is developed to provide a strategic objective, priority action and environmental indicator for managing the environment.

ACRONYMS

CBA	Critical Biodiversity Areas
CBD	Central Business District
CMA	Catchment Management Agencies
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DMR	Department of Mineral Resources
DSOE	Desired State of the Environment
DWS	Department of Water and Sanitation
ECF	Environmental Constraints Framework
EIA	Environmental Impact Assessment
EIS	Ecological Importance & Sensitivity
EMC	Environmental Management Class
EMPr	Environmental Management Programme
EWR	Ecological Water Requirements
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
HGM	Hydrogeomorphic
IBA	Important Bird Area(s)
IDP	Integrated Development Plan
I&AP	Interested and/or affected parties
MAP	Mean Annual Precipitation
MASL	Meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act
PAES	Protected Areas Expansion Strategy
PES	Present Ecological State
PDA	Primary Drainage Area
PPP	Public participation process
QDA	Quaternary Drainage Area
REC	Recommended Ecological Category (or Class)
REMC	Recommended Ecological Management Category (or Class)
RVI	Riparian Vegetation Index
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SDI	Spatial Development Initiative
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
SWSA	Strategic Water areas of South Africa
WMA	Water Management Areas
WUL	Water Use Licence
WULA	Water Use Licence Application

INTRODUCTION

Texture Environmental Consultants have been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed Eldorette Extension 54 development.

The EIA will conform to the National Environmental Management Act 107 of 1998 and to the Environmental Impact Assessment Regulations of 8 December 2014, as amended.

Texture Environmental Consultants need to develop an EMPr for the construction and operational phases of Eldorette Extension 54.

Locality of project

The study site is located on Holding 42, Heatherdale Agricultural Holdings. The subject property falls in the jurisdictional area of the City of Tshwane Metropolitan Municipality (CTMM) and forms part of Planning Region 1 and Ward 98. The study site is situated on 1st Avenue, south of the N4 Highway and east of the Mabopane Highway (R80).
The proposed project is set out in the Location Maps below. Please refer to Figure 1: Locality Map and Figure 2: Locality Map (Google earth).

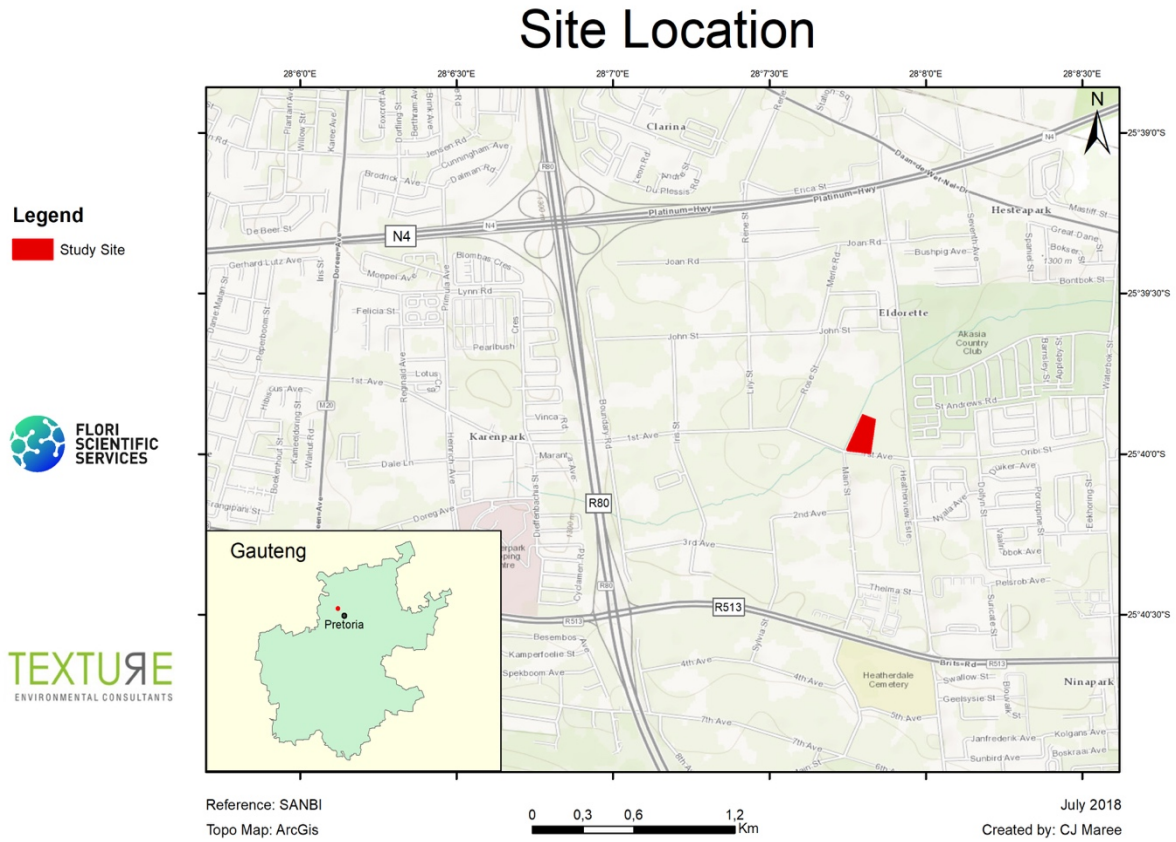

Figure 1: Locality Map

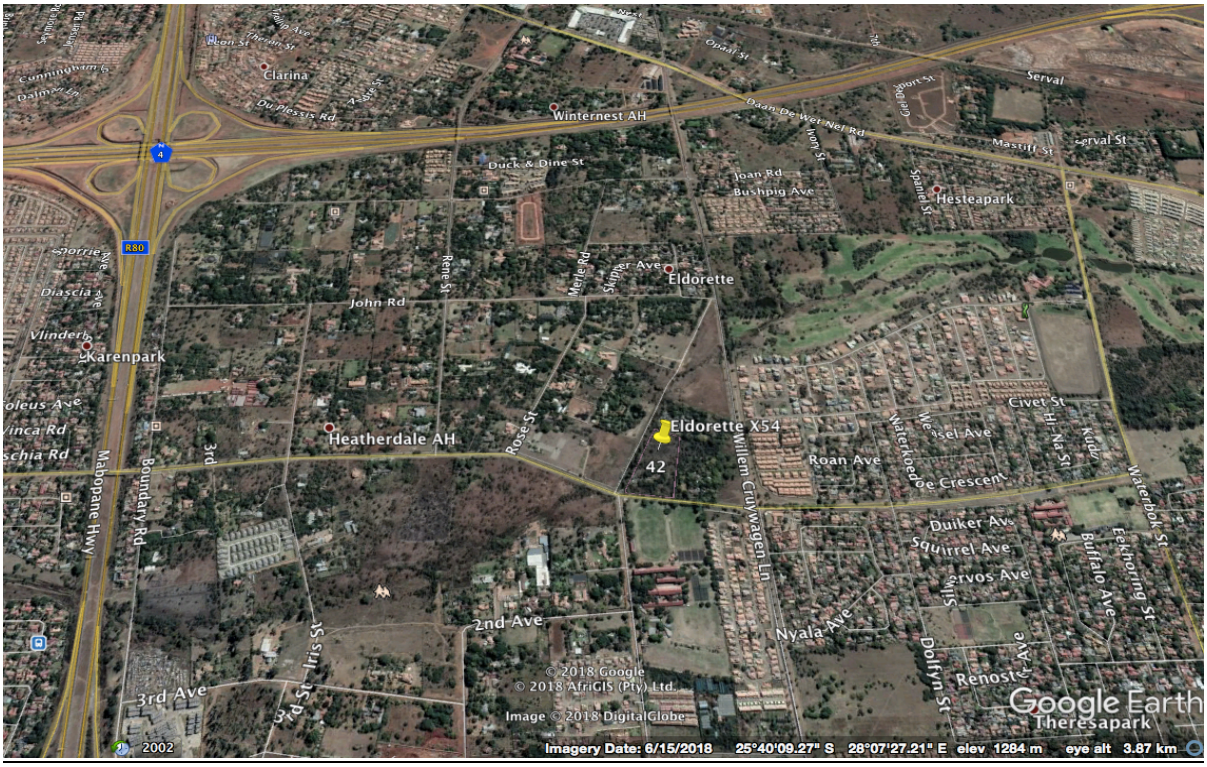

Figure 2: Locality Map (Google earth)

Property descriptions

The applicable property is indicated as follows:

Description	Extent (ha)	SG Diagram No
Holding 42, Heatherdale AH.	2.1883	T0JR01050000004200000.

The proposed project is situated in City of Tshwane Metropolitan Municipality, Gauteng Province.

Description of the Project

This environmental application is for the establishment of Eldorette Extension 54 on Holding 42, Heatherdale Agricultural Holdings. The project involves the proposed construction of a residential township on a property of 2.1883 hectares.

In addition to the environmental application, an application by Metroplan Town planners is made in terms of Section 16 (4) of the City of Tshwane Land Use Management By-law, 2016 and as required in terms of Schedule 6 to the said By-law for the establishment of Eldorette Extension 54.

Herewith a summary of the respective land use categories proposed:

1. Erven 395 – 439, 448 and 449 constitutes forty-seven (47) erven which will be zoned “Residential 1”.
2. Erf 450 will be zoned “Special” for private roads.
3. Erf 451 will be zoned “Public Open Space” and accommodates the area affected by the floodline as well as a 32m regulated area for environmental purposes; and
4. The remaining land will be zoned “Existing Streets” and will allow for the widening of Daphne Road (First Avenue) by 4.63m per the requirement of the ‘Tshwane Road Master Plan’.

The proposed development composition (i.e. zoning, land use, stand number, number of stands, extent etc.) is set out in the Table below as well as on the Township layout plan for Eldorette Extension 54.

Table 1: Proposed development controls

USE ZONE	PROPOSED USE ZONE	ERF NO	SIZE (HA)	HEIGHT	FAR	COV.	DENSITY	% of AREA
1	Residential 1	395 – 439, 448 & 449	1.1060	10m (2 storeys)	N/A	65 %	200m² erven	52
28	Special for private road	450	0.5362	10m (2 storeys)	0,10	10 %	N/A	25
20	Public Open Space	451	0.4175	SDP	SDP	SDP	N/A	20
22	Existing Streets	-	0.0586	N/A	N/A	N/A	N/A	3

The proposal includes the construction of associated infrastructure, including access road, civil services (water, sewer and stormwater reticulation) and electricity.

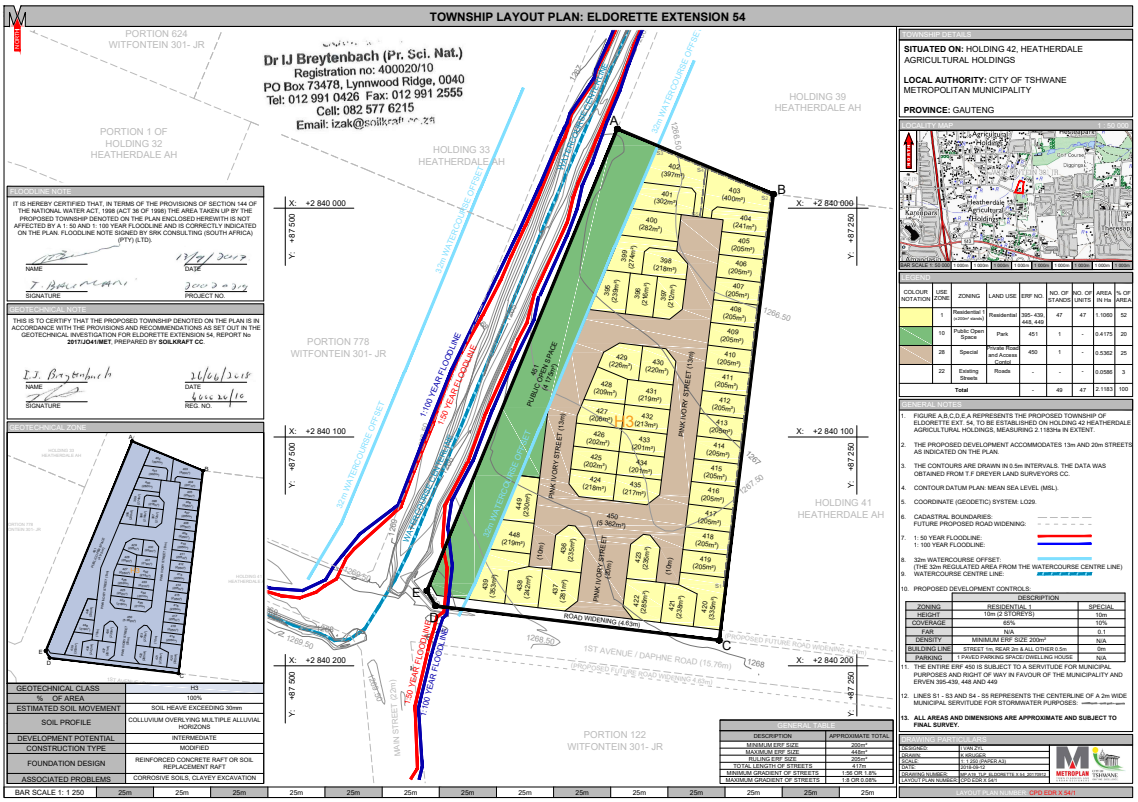

Figure 3: Site Layout Plan

Environmental authorisation

An application for environmental authorisation has been submitted to the Gauteng Department of Agriculture and Rural Development (GDARD) in terms of the National Environmental Management Act 107 of 1998 (NEMA) and the Environmental Impact Assessment Regulations, 2014 for the following listed activities:

Table 1: Listed activities

Listed Activity	Activity/ Project Description
Listing Notice 1 Activity 19 The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	To make provision for the excavation or infilling of more than 10 cubic metres of soil from a watercourse if required. Infilling and / or **excavation within the 1:100 year flood lines** will have to be done to construct civil services in the 1:100 year flood line areas.
Listing Notice 1 Activity 27	The construction of the proposed

The **clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation**, except where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	development will entail the clearance of more that 1 hectares of indigenous vegetation, but less than 20 hectares. The impacted study area is 2,1183 ha of which 0,4175 ha will be zoned as private open space and maintained as park area. As a result, approximately **1,7008 hectares of indigenous vegetation** will thus be cleared.
Listing Notice 3 Activity 4 The **development of a road wider than 4 metres** with a reserve less than 13,5 metres. c. Gauteng (i) A protected area identified in terms of NEMPAA, excluding conservancies; (ii) National Protected Area Expansion Strategy Focus Areas; (iii) Gauteng Protected Area Expansion Priority Areas; (iv) Sites identified as Critical Biodiversity Areas (CBAs) or **Ecological Support Areas (ESAs)** in the Gauteng Conservation Plan or in bioregional plans; (v) Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); (vi) Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; (vii) Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas; (viii) Important Bird and Biodiversity Area (IBA); (ix) Sites or areas identified in terms of an international convention; (x) Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; (xi) Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; or (xii) Sites zoned for conservation use or public open space or equivalent zoning.	According to the Gauteng Conservation Plan (C-Plan) version 3.3, the study area is outside of Critical Biodiversity Areas (CBAs), but borders on an **Ecological Support Area (ESA).** The demarcated ESA is the small stream that flows southwest and west of the study area. Access to the development will be from the existing First Avenue on the southern boundary of the site. The access **road will be 20 metres wide**.
Listing Notice 3 Activity 12 The clearance of an area of **300 square metres or more of indigenous vegetation** except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan c. Gauteng (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) Within Critical Biodiversity Areas or **Ecological Support Areas** identified in the Gauteng Conservation Plan or bioregional plans; or (iii) On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	According to the Gauteng Conservation Plan (C-Plan) version 3.3, the study borders on an **Ecological Support Area** (ESA).
Listing Notice 3 Activity 14 The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a **physical footprint of 10 square metres** or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, **within 32 metres** of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. c. Gauteng i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) or **Ecological Support Areas** (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites or areas identified in terms of an international convention; viii. Sites managed as protected areas by provincial authorities, or declared as	Infrastructure or structures with a physical footprint of 10 square metres or more will be constructed **within 32 metres of the 1:100 year flood line area.**

nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; ix. Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; or x. Sites zoned for conservation use or public open space or equivalent zoning.	

Purpose of the EMPr

The developer/EAP has an obligation to conduct a project specific Environmental Impact Assessment (EIA) and to abide by a site specific Environmental Management Programme (EMPr).
The developer must take reasonable measures to protect the environment and minimise environmental impacts as required by the Duty of Care stated in section 28 of NEMA. The applicant as the holder of Environmental Authorisation must also ensure that contractors conducting work on its behalf comply with environmental requirements. The contractor has to ensure that construction activities do not deviate from conditions stipulated in the Environmental Authorisation, EMPr and the requirements of applicable environmental legislation.
During all the phases of the project, proper monitoring, auditing and corrective actions and measures have to be implemented. The following principles have to form the basis of the construction and operational phases:

- Prevent or minimise pollution and degradation of the environment.
- Implement a risk-averse and cautious approach.
- Prevent or minimise waste, reuse or recycle waste where possible and dispose of waste in a responsible manner.
- Anticipate and prevent negative impacts on the environment. Where impacts cannot be prevented, minimisation and mitigation measures to be implemented.
- Prevent, minimise or remedy (rehabilitate) the disturbance of ecosystems and loss of biodiversity.

The overall desired outcome of the EMPr is that the proposed mixed use project will contribute significantly to the goal of sustainable development of the region and Province, while at the same time limiting additional impact on the environment.

It is therefore important to develop and implement mitigation measures to ensure that environmental damage is minimised. For the mitigation measures to be effectively implemented, proper planning and communication is essential throughout the project, specifically during the construction phase. An Environmental Management Programme is a detailed plan of action prepared to ensure that recommendations for preventing the negative environmental impacts (and where possible improving the environment) are implemented during the life-cycle of a project. The appointed contractor has to understand the requirements of the Environmental Management Programme (EMPr) and where possible initiate environmental best practices in liaison with the applicant. This EMPr is divided into three sections: Planning and Design Phase, Construction Phase and Operational Phase.

STRUCTURE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr provides mitigation and management measures for the following phases of the project:

1. Planning and Design Phase

All relevant environmental legislation pertaining to the project is listed during this phase.
The Contractor and the applicant have to comply with the legislation during all phases of the project. This list is not exhaustive and is intended only to serve as a guideline for the Contractor.

2. Construction Phase

This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required within the construction phase are specified. These specifications should form part of the construction contract and the Contractor is therefore required to comply with the specifications in the construction contract to the satisfaction of the Project Manager and Environmental Control Officer.

3. Operation and Maintenance Phase

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required by the applicant within the operation and maintenance phase are specified. The EMPr is a dynamic document which is updated as required on a continuous basis.

Identification and Management of Environmentally Sensitive Areas

Sensitive areas such as heritage sites, rivers, streams, wetlands, nesting areas of protected bird species, rocky ridges, rocky outcrops (koppies), etc. have to be identified in the early stages of the project.
Such areas to be clearly marked as high sensitive areas or no-go zones and environmental induction has to emphasise the importance of complying with these requirements. The environmental sensitivity map indicates sensitive environmental areas and features identified in the activity area.
Natural features, which are considered sensitive and need to be avoided during planning are:

- The Watercourse areas

Ecological sensitivity of the study area

According to the analyses of the floristic, fanual and overall ecological sensitivities there are no high sensitivity areas or habitats. In other words, there are no 'No-Go' areas within the study area. Even though the actual ecological sensitivity of the stream is calculated to be 'Medium'; the sensitivity should be raised to 'High', as watercourses are, by default, considered sensitive. This has been done in the final sensitivity map, where the watercourse (Boepensspruit) is demarcated as having a sensitivity rating of 'High'.

According to the Gauteng Conservation Plan (C-Plan) version 3.3, the study area is outside of any Critical Biodiversity Areas (CBAs), but borders on an Ecological Support Area (ESA). The demarcated ESA is the small, semi-perennial stream, the Boepenspruit that flows southwest and west of the study area.

The layout options were investigated in terms of the layout for the proposed establishment so as to accommodate the floodline area. The property is impacted by flood lines as indicated and endorsed by the relevant engineer on the Layout Plan. The floodline Assessment was conducted by SRK Consulting Civil Engineers. According to the layout plans for the proposed development no development activities will take place within the stream, or riparian zone of the stream (most of which is situated outside of the study area). The 50-year and 100-year floodlines are also mostly outside of the actual study site. Only a small portion is within the south western border of the site. This small section is completely within the 32m regulated zone, which is recommended to be earmarked for 'Public open space' (green zone) as part of a positive impact from the proposed development. The sensitivity map for the study area is shown in the map below (Figure 3).

Figure 3: Sensitivity Map

Waste Management

An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste that cannot be recycled shall be disposed of at an appropriate landfill site licensed in terms of section 20 (b) of the National Environment Management Waste Act, 2008 (Act No 59 of 2008). A letter of agreement between the developer and the Permit Holder of the waste disposal site to be kept on site.

Final Design

The engineering drawings must adhere to any site-specific mitigation measures supplied by the geotechnical engineer for the project to accommodate the geotechnical and earth-scientific constraints in terms of founding and construction methods, construction materials, excavation, etc.

Legislative and Other Requirements

The contractor must identify and implement applicable sections of at least the following environmental legislation:

National Environmental Management Act (Act No. 107 of 1998) (as amended)
National Environmental Management: Waste Act (Act 59 of 2008) (as amended) NEMWA
National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM:AQA)
National Water Act, 1998 (Act No. 36 of 1998)
National Heritage Resources Act (Act No 25 of 1999)
National Environmental Management: Biodiversity Act (Act 10 of 2004)
National Environmental Management: Protected Areas Act. (Act No. 57 of 2003) (NEM:PAA)
Soil Conservation Act (Act No 76 of 1969)
National Road Traffic Act (Act No 93 of 1996)
Occupational Health and Safety Act (Act No. 85 of 1993)
Conservation of Agricultural Resources Act (Act 43 of 1983) (as amended)

National Forests Act (Act No 84 of 1998)
National Veld and Forest Fire Act (Act No 101 of 1998)
National Roads Act 7 of 1998
Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947
Hazardous Substances Act (Act 15 of 1973)
Health Act 63 of 1977
Minerals and Petroleum Resources Development Act. (Act No 28 of 2002)
Minerals and Petroleum Resources Development Amendment Act (Act No 49 of 2008)
National Building Regulations and Building Standards Act (Act 103 of 1977)
All relevant Provincial regulations and Municipal By-laws

Listed below are some of the possible permits and licences that may be required:

Table 2: Environmental Permits and Licenses:

Activity	Applicable Legislation
Disturbing, cutting, pruning protected or indigenous vegetation; or any protected tree	National Forests Act (No 84 of 1998), National Environmental Management: Biodiversity Act, (No 10 of 2004), Provincial Ordinances
Taking water from a water resource	The National Water Act (No 36 of 1998)
Storing of water	The National Water Act (No 36 of 1998)
Impeding or diverting the flow of water in a watercourse	The National Water Act (No 36 of 1998)
Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	The National Water Act (No 36 of 1998)
Disposing of waste in a manner which may detrimentally impact on a water resource	The National Water Act (No 36 of 1998)
Use of treated wastewater	The National Water Act (Act No 36 of 1998)
To destroy, damage, deface, alter, remove or destruct any national and provincial heritage sites, archaelogical and palaeontological sites, burial grounds and graves and public monuments and memorials	National Heritage Resources Act (No 25 of 1999)
Sewage Disposal	National Environmental Management Act (Act No 107 of 1998)
Fuel storage	Local By-laws, National Environmental Management Act (No 107 of 1998)
Ablution facilities/ chemical toilets	Local By-laws, Provincial standard By-laws
Operation of borrow pits	Mineral and Petroleum Resources Development Act (No 28 of 2002).

The contractor must keep a permit matrix listing the type of permits and their validity periods. The permit matrix must be updated as and when required. The conditions prescribed in the permits must be adhered to.

Tender Stage

The EMPr and Environmental Authorisation form part of the documentation issued at tender enquiry stage. Environmental tender evaluation has to be conducted to ensure that the tender submissions include, amongst others, financial and human resources for proper implementation of environmental requirements.

Contract Award

The contractor has to acknowledge receipt and understanding of the EMPr and Environmental Authorisation. The EMPr and Environmental Authorisation must form part of the Contract Award Documentation issued by the Client.

CONSTRUCTION PHASE

Roles, Responsibilities and Reporting

1 Applicant

Cosyspro (Pty) Ltd is the proponent of the project and therefore has the overall responsibility to ensure that the construction activities comply with requirements of the Environmental Authorisation, Environmental Legislation and any other applicable legislation. The holder of the authorisation must have processes in place to ensure that at least the EMPr and Environmental Authorisation are issued during tender enquiry. They must periodically audit the contractors who work on their behalf to verify compliance with environmental specifications and must appoint an independant Environmental Control Officer (ECO) prior to commencement of construction (if stipulated in the Environmental Authorisation). GDARD must be notified of such an appointment.
The SECO (Site Environmental Control Officer) or CEO (contractor Environmental Officer), the Applicant and ECO must inspect the construction site on a regular basis (during pre-construction, construction and post-construction periods) to confirm the current state of the site and to ensure that the mitigation and rehabilitation measures as specified in the EMPr are applied. These officers may make reasonable amendments to the EMPr in co-operation with the contractor.

2 Contractor Roles and Responsibilities

The role of the contractor entails the implementation of Environmental Requirements during construction. Amongst others, the contractor must:

- Appoint and designate a person responsible for managing all requirements of the construction EMPr and applicable environmental legislation.
- Implement the requirements of the EMPr throughout the construction period.
- The Contractor's Project Manager has to assign the appropriate authority, accountability and responsibility to these personnel to carry out their duties.
- The Contractor is responsible for ensuring that subcontractors are aware of their environmental responsibilities while on site or during the provision of their services.
- The Contractor must ensure that all sub-contractors and other workers appointed by the Contractor comply with and implement the construction EMPr during the duration of their specific contracts.
- The Contractor must be familiar with the contents of the EMPr and be knowledgeable about the legislative requirements for the construction works, and ensure that work does not commence without the appropriate permits and licences being obtained or provided by the client.
- Site-specific measures in terms of ecology as identified by the ecologist must be included in the contract with the Contractor and implemented by the Contractor during the construction phase. These measures should be included in the EMPr.
- Undertake daily site inspections to monitor environmental performance and conformance with the Environmental Specifications;
- Notify the ECO and the Client in the event of any accident or deviations to Environmental Requirements and ensure that proper remedial action is taken;
- Ensure environmental awareness among his employees, sub-contractors and workforce so that they are fully aware of and understand the Environmental Requirements for implementation on site;
- Maintain a register of environmental training for site staff and sub-contractor's staff for the duration of the contract;
- Undertake rehabilitation of all areas affected by construction activities to restore them to their original or satisfactory state;
- Rehabilitate all the areas disturbed by the construction activities;

- Ensure that daily risk assessments conducted on-site include environmental risks that may arise due to the daily construction activities being carried out;
- Keep construction records and reports related to environmental work, for instance, public complaints register, incident register, inspection reports, method statements, environmental induction records etc;
- Ensure that monthly SHE meetings include environmental topics for discussion or separate environmental monthly meetings are conducted where environmental issues can be discussed. Environmental performance must be tracked in these meetings;
- Audit the subcontractors to determine compliance against environmental requirements.
- The Contractor must prepare Method Statements, layout plans, drawings for related activities and submit these for approval or acceptance by the Client and/or the ECO.

3 Sub-Contractor Management

It is the responsibility of the principal/main contractor to manage and monitor the activities of all the sub-contractors to ensure compliance with the EMPr, Environmental Authorisation and applicable Environmental Legislation. The agreements between the principal contractor and subcontractor have to include environmental requirements implementation. The principal contractor has to monitor the activities of the sub-contractor during, amongst others, site inspections and audits.

4 Environmental Control Officer

Some of the roles and responsibilities of the Environmental Control Officer include the following:

- An Environmental Control Officer (ECO) should be appointed for the proposed construction phase of the development to enforce the approved EMPr. The appointed ECO details should be forwarded to the GDARD upon appointment.
- Signing off or acceptance of method statements for adequacy prior to work commencing.
- Monitoring construction activities performance to confirm that identified control measures are effective.
- Act as the main point of contact between the regulatory authorities and the project on environmental issues.
- Conduct inspections and audits as per environmental authorisation requirements.
- The key responsibility of the ECO is to monitor compliance with all the conditions stipulated in the Environmental Authorisation (EA), environmental legislation and the recommendations of the EMPr.
- The ECO must liaise with an appointed contractor's personnel responsible for environmental management and/or attend site meetings where applicable and inspect the construction site on a regular basis to ensure that the mitigation and rehabilitation measures are implemented.
- The ECO will remain employed until all rehabilitation measures are completed and the site is handed over by the contractor for operation.
- Liaise with the landowners on any construction related complaints that might arise.
- The ECO is also responsible for compiling monthly progress reports containing any issues arising, etc. and submitting them to the relevant departmens, such as the GDARD.

Environmental Documentation Reporting and Compliance

A number of reporting systems, documentation controls and compliance mechanisms shall be in place for all substation projects as a minimum requirement.

1 Document control/Filing System

The approved filing system (in accordance with ISO 9000) shall be established at the outset of the construction phase and shall be maintained throughout the lifespan of the project. The ECOs are solely responsible for the upkeep and management of the EMPr file. At a minimum, all documentation detailed below will be maintained in the office of the Developer's site supervisor (where applicable).This duplicate file will be the responsibility of the ECOs and must remain current and up-to-date. The filing system must be updated and relevant documents added as required. The EMPr must be made available at all times on request by the Competent Authority (in terms of NEMA) or other relevant authorities. The EMPr file will form part of any Environmental Audits undertaken.

2 Documentation to be available

- Full copy of the signed Environmental Authorisation from the Competent Authority in terms of NEMA granting approval for the activity;
- Records off acknowledgement and acceptance of the EMPr from the Competent Authority in terms of NEMA;
- Complete copy of the EMPr;
- All signed copies of the Contractor's Environmental Agreement;
- All the Contractor's Method Statements;
- Completed Weekly Environmental Checklists;
- Copies of the accepted Monthly Environmental Reports;
- Minutes and attendance register of Environmental Site meetings;
- An up-to-date Environmental Incident Log;
- A copy of all non-compliances issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record;
- Copies of the following relevant legislation:
    - National Environmental Management Act;
    - Environmental Conservation Act;
    - Occupational Health and Safety Act;
    - National Water Act;
    - National Environmental Management: Air Quality Act;
    - Conservation of Agricultural Resources Act;
    - National Heritage Resources Act.

3 Weekly Environmental Checklists

The ECOs are required to complete a Weekly Environmental Checklist which meets the requirements of the EMPr. The ECOs are required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the Developer's Site Supervisor on a weekly basis. The checklists will form the basis for the Monthly Environmental Reports. Copies of all completed checklists will be attached as Annexures to the Final Environmental Audit Report. The ECOs will report on the week's "highs and lows" to the Senior Site Representative on a weekly basis.

4 Environmental Audit Reports

The ECOs shall prepare a monthly Environmental Audit Report. The Report will be tabled as the key point on the agenda of the Environmental Site Meeting. The Report is submitted for acceptance at the meeting and the final report will be circulated to the Project Manager and filed in the EMPr file. At a frequency determined by the environmental authorisation, the ECOs shall submit the monthly reports to the Competent Authority in terms of NEMA. At a minimum the Monthly report is to cover the following;

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- General environmental findings and actions; and
- Minutes of the Bi-monthly Environmental Site Meetings.

5 Environmental Site meetings

An Environmental Site Meeting will take place at least bi-monthly (i.e. every two weeks). The meeting will be chaired by the Project Manager or the Developer's Site Supervisor and CEOs will be required to attend. All environmental issues shall be tabled at the meeting for discussion and resolution. Minutes of the Environmental Site Meetings shall be kept. The Minutes must include an attendance register and will be attached to the Monthly Report that is distributed to attendees. Each set of Minutes must clearly record **Matters for Attention** that will be reviewed at the next meeting.

6 Required Method Statements

A Method Statement is a written submission by the contractor to the Developer's Project Manager, Developer's Site Supervisor or ECO in response to the EMPr, setting out the plant, materials, labour and method the contractor proposes using to carry out an activity. The Method Statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.
The Method Statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from 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 the EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following Method Statements to the Project Manager no less than 14 days prior to the programmed Commencement Date of the subject Works or activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);

- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management. The ECOs shall ensure that the contractors perform in accordance with these Method Statements.

7 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary). The Environmental Incident Log is a means to record all environmental incidents for which a non-compliance notice would **not** be issued. An environmental incident is defined as:

- Any deviation from the listed environmental mitigation measures (listed in this EMPr) that may be addressed immediately by the ECOs. (for example a contractor's staff member littering or a drip tray that has not been emptied);
- Any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the Environmental Audit Report.

8 Non-compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the Developer's Site Supervisor or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.

The Contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed.

Failure to address the cause shall be reported to the relevant authority (DAFF, GDARD, DWS) for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, inter alia:

- Deviates from the environmental conditions and requirements as set out in the EMPr that has, or may cause, an environmental impact; OR
- Contravenes environmental legislation; OR
- Results in an unforeseen environmental impact. This may be caused by direct or indirect actions or activities on site. Significance will be determined by the ECOs, but will be informed by geographic extent, duration, lasting effects of the impact and extent of remediation to rectify the impact.

9 Corrective Action records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the Developer's Site Supervisor, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report signed off by the ECOs.

10 Contractor Environmental Agreements

Each contractor working on site is required to sign the Contractor Environmental Agreement. This agreement provides for:

- Signed acknowledgement by the Contractor of the EMPr and the environmental controls and stipulations therein;
- The signed copies of the Contractor Environmental Agreements are to be filed in the EMPr file. No contractor will be allowed to start work without having signed the Contractor Environmental Agreement.

11 Photographic Record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.
The Contractor shall:

- Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

- Pictures of all areas designated as work areas, camp areas, construction sites and storage areas taken before these areas are set up;
- All bunding and fencing;
- Road conditions and road verges;
- Condition of all farm fences;
- Topsoil storage areas;
- Waste management sites;
- Ablution facilities (inside and out);
- Any non-conformances deemed to be "significant";
- All completed corrective actions for non-compliances;
- All required signage; and
- All areas before, during and post rehabilitation. Include relevant photographs in the Final Environmental Audit Report

12 Complaints Register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of all complaints received from communities, stakeholders and individuals. The Complaints Record shall:

- Record the name and contact details of the complainant;
- Record the time and date of the complaint;
- Contain a detailed description of the complaint;
- Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
- Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in bullet point below.

13 Claims for Damages

In the event that a Claim for Damages is submitted by a community, landowner or individual, the ECOs shall:

- Record the full detail of the complaint as described in bullet point above;
- The ECOs will evaluate the claim and associated damage and submit the evaluation to the Senior Site Representative for approval;
- Following consideration by the Developer's Project Manager, the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant. Should the claimant not accept this, the ECO shall, in writing report the incident to the Developer's negotiator and legal department; and
- A formal record of the response by the ECOs to the claimant as well as the rectification and/or payment will be recorded in the EMPr file.

14 Interaction with affected parties

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts. The Contractor shall ensure that:

- All negotiations with affected parties are done with the affected parties, Developer's Site Supervisor and ECO present;
- No oral agreements between the above parties shall be entered into. All agreements will be recorded in writing, signed by all parties and filed in the EMPr file;
- Affected parties will be informed by the cEO of any changes to the construction programme;
- The Contractor's contact telephone numbers are made available to all I&APs;.
- Contact with all affected parties will be courteous at all times; and

The ECOs shall:

- Ensure that all queries, complaints and claims are dealt with immediately;
- Ensure that any or all negotiations take place with the affected parties, Senior Site Representative and Contractor present;
- Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file;
- Ensure that his/her contact telephone numbers are made available to all landowners and affected parties;
- Ensure that a current and up-to-date list of affected parties and their contact details are available at all times in the EMPr file;
- Ensure that contact with affected parties is courteous at all times; and
- Attach all documented agreements, settlements and claims to the Final Environmental Audit Report.

15 Environmental Audits

Environmental Audits of the construction phase and implementation of the EMPr will be undertaken by the ECO and are a legal requirement in terms of NEMA once an EA is issued and as long as the EMPr is valid. The findings and outcomes of these audits will be recorded in the EMPr file. The environmental audits and associated reports must be conducted and submitted to the Competent Authority at intervals as indicated in the environmental authorisation.

16 Final Environmental Audit Report

On final completion of the Construction Phase, the ECOs are required to prepare a Final Environmental Audit Report. The Report is to be submitted to the Competent Authority for acceptance and approval. The Environmental Report shall contain the following in accordance with Appendix 7 of National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental impact Assessment Regulations, 2014.

- Details of the independent person who prepared the report;
- Details of the expertise of the independent person that compiled the report;
- A declaration that the independent auditor is independent in a form as may be specified by the Competent Authority;
- An indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- A description of the methodology adopted in preparing the environmental audit report;
- An indication of the ability of the EMPr, and where applicable, the closure plan to-
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
    - Ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- A description of any assumptions made, and any uncertainties or gaps in knowledge;
- A description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- A summary and copies of any comments that were received during any consultation process; and
- Any other information requested by the Competent Authority.

Acceptance and approval of the Final Environmental Audit Report by the Competent Authority will end the construction phase EMPr as successful and completed.

General Environmental Controls

This section refers to construction related activites that are common to projects and a set of predescribed environmental controls and management actions to mitigate their impact.

1 Environmental awareness training

- Section 28 of NEMA places a duty of care on the applicant to ensure that reasonable measures are taken to prevent pollution or degradation of the environment from occurring, continuing or recurring. Should any environmental damage result, the applicant must within 14 days rectify the situation to its original state, at his or her own expense.
- All staff shall receive environmental awareness training ;
- The contractor shall allow for sufficient session to train all personnel with no more than 20 personnel attending each course;
- All new staff coming onto site shall receive environmental awareness training;
- Refresher environmental awareness training is available as and when required;
- All staff are aware of the conditions and controls linked to the Environmental Authorisation and within the EMPr;
- All staff are made aware of their individual roles and responsibilities in achieving compliance with the environmental authorisation and EMPr;
- The contractor shall erect and maintain information posters at key locations on site;
- Environmental awareness training should include as a minimum the following;
    - Description of significant environmental impacts, actual or potential, related to their work activities;
    - Mitigation measures to be implemented when carrying out specific activities;
    - Emergency preparedness and response procedures;
    - Emergency procedures;
    - Procedures to be followed when working near or within sensitive areas;
    - Wastewater management procedures
    - Water usage and conservation;
    - Solid waste management procedures;
    - Sanitation procedures;
    - Disease prevention; and
    - Chance find procedures for archaeological/paleontological/historical sites unearthed during construction;
- A record of all environmental awareness training courses undertaken as part of the EMPr must be available;
- A staff attendance register of all staff to have received environmental awareness training must be available;
- Course material must be available and presented in all appropriate languages.

2 Construction site establishment

- A method statement shall be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form a plan showing the location of the key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and laydown areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of the staff accommodation, cooking and ablution facilities, waste and wastewater management;
- Location of construction camps must be carefully considered and approved by the ECOs to ensure that the sites does not impact on sensitive areas identified in the EIA or site walk through;
- Sites should be located where possible on previously disturbed areas.
- The construction camp shall be fenced; and
- The use of existing accommodation for contractor staff, where possible, is encouraged.

3 No-Go areas

- Identification of No-Go areas is to be informed by the EIA and any additional areas identified during construction;
- The 1:100 year floodline areas are excluded from any development and to be seen as a No-Go area during construction;
- Only development activities such as the construction of civil services in the flood line area, are to be allowed if a Water Use Licence has been obtained from the Department of Water and Sanitation;
- Erect, demarcate and maintain a temporary fence around the perimeter of any No-Go area;
- Fencing of No-Go area is to be undertaken*;* and
- Unauthorized access and construction related activity inside No-Go areas is prohibited.
- No-Go Areas have to be identified prior to activity commencement at any locality. For instance, areas of heritage importance, nesting areas for sensitive birds, wetlands, protected trees which the project activities can impact on, etc have to be identified in advance and proper signage indicating such areas as No-Go Areas have to be placed.
- The No-Go Areas register must be developed and updated as necessary and these areas have to form part of the induction content. Further signage to be placed at all the campsites, material laydown areas, and batch plants (if established outside the main office areas).
- The plastic warning/danger tape cannot be used to demarcate No-Go areas in the field as this will pose danger of ingestion by animals should littering occur.

4 Landowner/community Liaison

- The ECO and contractor representative or land liaison officer have to liaise with the landowner(s) and the affected community before construction activities commence.
- The applicable Emergency telephone numbers should always be available on site. The contact details of the Holder of the authorisation's Environmental Officer should be available on site.
- A copy of the EMPr has to be submitted to the relevant landowner(s) if they request it. They can assist the Holder of the authorisation in assuring that the Contractor adheres to rules as stipulated and that mitigation and rehabilitation measures are applied.
- The community has to be informed of the commencement date of construction as well as the phases in which the construction will take place.
- Access roads and any other land uses such as camp sites and laydown material areas to be agreed upon with the landowner(s).
- Landowner(s) to be informed of the type of activities that will take place in their properties.
- The construction activities have to be properly planned to cater for disruptions that might be caused by rain and very wet conditions.
- The Contractor must adhere to conditions stipulated in the landowner's agreement documents and any other special conditions that have been agreed to with the landowner and signed off by the parties involved.
- Where existing roads are in a bad state of repair, such roads' condition has to be documented before the roads are used for construction purposes.
- If necessary some repairs have to be done to prevent damage to equipment and plant.
- All manmade structures to be protected against damage at all times and any damage to be rectified immediately.
- The contractor has to conduct regular site inspections and good control over the construction process during the construction period.
- The contractor must ensure that the landowner is satisfied with rehabilitation work and must ensure that the landowner sign off release documentation as required.

5 Access roads

- Maximum use of existing roads shall be made;

- In circumstances where private roads must be used, the condition of the said road shall be recorded prior to use and the condition thereof agreed by the landowner, the Development Project Manager and the contractor;
- All private roads used for access to the site shall be maintained and upon completion of the works, be left in at least the original conditions. A far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes;
- Access roads shall be constructed in accordance with design standards (SANS1200).

6 Fencing and gate installation

- The fencing Act No 31 of 1963 shall be adhered to at all times with regards to the leaving of open gates and the dropping of fences for crossing purposes, climbing and willful damage or removal of gates;
- Use existing gates provided to gain access to all parts of the defined Working areas, where possible;
- All gates shall be fitted with locks and be kept locked at all times during the construction phase, unless otherwise agreed with the landowner;
- Where there is no suitable gate for access to the site, on the instruction of the Development Project Manager, a gate shall be installed;
- Care shall be taken that the gates shall be so erected that there is a gap no more than 100 mm between the bottom of the gate and the ground;
- Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill shall be provided beneath the gate;
- Original tension shall be maintained in the fence wires;
- All gates in electrified fencing must be re-electrified;
- All demarcation fencing and barriers shall be maintained in good working order for the duration of construction activities;
- Fencing shall be erected around the construction camp, batching plants, hazardous storage areas, and all designated no-go areas, where applicable;
- All fencing shall be constructed of high quality material bearing the SABS mark;
- The use of razor wire as fencing shall be avoided;
- Fenced areas with gate success will remain locked after hours, during weekends and on holidays if staffs are away from the site. Site security will be required at all times;
- On completion of the project all temporary fences are to be removed and where possible be re-used by the contractor at new projects;
- The contractor will ensure that all fences uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.

7 Water supply management

- All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on daily basis;
- The contractor has to determine whether a water use licence or a General Authorisation is required for the abstraction of water used for construction purposes or office related use prior to the commencement of such abstraction. Such permits to be obtained and kept on site.
- In all cases, abstraction of water for construction purposes requires a permit from the Department of Water and Sanitation unless pre-existing rights are purchased from landowners.
- Should water abstraction be required and the necessary authorization and permission from the landowner has been received, the contractor shall ensure the following:
    - The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river;
    - No damage occurs from the river bed or banks and that the abstraction of water does not entail stream diversion activities and

  - All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented.
- Ensure water conservation is being practiced by;
  - Minimizing water use during cleaning of equipment;
  - Undertaking regular audits of water systems; and
  - Including a discussion on water usage and conservation during environmental awareness training.

8 Storm Water Management

- Water diversion berms have to be built immediately after creating new roads.
- Water outlets have to be made at intervals where berms are installed and suitably stone pitched if required.
- The storm water discharge points must be inspected regularly especially during the rainy season.
- Where these are damaged, they have to be repaired to avoid soil erosion.
- A storm water management method statement must be developed and approved for use.
- Erosion protection and sediment traps have to be placed at storm water outfalls where appropriate.

9 Waste water management

- Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into watercourses or water bodies shall be designed and implemented;
- Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Project Manager;
- All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility;
- Natural storm water runoff not contaminated by construction operations and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO;
- Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment shall be subject to the Project Manager's approval and support by the ECO.

10 Solid waste management

- All measures regarding waste management shall be undertaken using an integrated waste management approach;
- Sufficient, covered waste collection bins (scavenger and weatherproof) shall be provided;
- A suitably positioned and clearly demarcated waste collection site shall be identified and provided;
- The waste collection site shall be maintained in a clean and orderly fashion;
- Waste shall be segregated into separate bins and clearly marked for each waste type;
- Staff shall be trained in waste segregation;
- Recycling of waste types shall be maximised;
- Bins shall be emptied regularly;
- General waste shall be disposed of at recognised and registered waste disposal sites/ recycling company;
- Hazardous waste shall be disposed of at a registered waste disposal site;
- Certificates of disposal for general, hazardous and recycled waste shall be maintained;
- Under no circumstances shall any waste be disposed of, burned or buried on site.

11 Protection watercourses and water bodies

- All watercourses and water bodies shall be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities;
- In the event of a spill, prompt action shall be taken to clear the polluted or affected areas;
- Where possible, no construction equipment shall traverse any seasonal or permanent wetland;
- No natural watercourse or water body shall be used for the purposes of swimming, personal washing and the washing of machinery or clothes;
- Excavation or construction in a water course or wetland area shall be avoided unless exceptional circumstances require that excavation or construction cannot be avoided
- Road construction shall be in accordance with SANS 1200;
- No excavation or construction shall be permitted within the 1:100 year flood line or riparian zone (whichever is the greatest) of a watercourse or within 500 m from the boundary of a wetland area without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation;
- When working in or near any watercourse or wetland, the following environmental controls and consideration shall be taken:
    - River levels during the period of construction;
    - Construction within flowing water is to be minimised. All diversions shall be in place, water diverted away from the Working Area and the area properly stabilised prior to excavations commencing;
    - When working in flowing water, downstream sedimentation shall be controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geotextile silt curtains or sedimentation weirs constructed out of suitably secured straw bales. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities;
    - During the execution of the Works, appropriate measures to prevent pollution and contamination of the riverine environment shall be implemented e.g. including ensuring that construction equipment is well maintained;
    - Where earthwork is being undertaken in close proximity to any watercourse, slopes shall be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and
    - Appropriate rehabilitation and re-vegetation measures for the river banks shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as construction allows.

12 Vegetation clearing

- Indigenous vegetation which does not interfere with the safe construction of the development shall be left undisturbed;
- Protected or endangered species may occur on or near the construction site. Special care should be taken not to damage such species;
- Search, rescue and replanting of all protected and endangered species likely to be damaged during construction shall be identified by the Botanical Specialist and completed prior to any construction or clearing;
- Permits for removal must be obtained from the relevant Competent Authority prior to the cutting or clearing the affected species;
- The Final Environmental Audit Report shall confirm that all identified species have been rescued and replanted;
- Debris through vegetation clearing shall not be burned under any circumstances;
- Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and debris;

- The use of herbicides shall be in compliance with the terms and conditions of The Fertilisers, Farm, Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947);
- Only a registered pest control operator may apply herbicides on a commercial basis and commercial application shall be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained;
- A register shall be kept of all relevant details of herbicide usage as stipulated in Act 36 of 1947;
- Trees, shrubs, grass, natural features and topsoil which are not removed during vegetation clearance shall be protected from damage during operation of the substation;
- All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off if required in accordance with No-Go procedure in Section 3: No-Go areas.
- Alien vegetation on-site shall be managed in terms of the GNR 1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983;
- Alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility.

13 Plant Rescue and Protection Plan

- No plants are to be removed unnecessary.
- Remove any bulbous plants (orchids, lilies, etc) found growing directly in the area where the structure is to be erected.
- Immediately replant any lifted bulbs nearby, or in a similar habitat.
- Any lifted bulbs to be handled with care to avoid physical damage, which could lead to them dying or reduce their changes of successfully re-establishing on the new site.
- Immediately after construction (within two weeks) a mix of local, indigenous grass seeds to be sowed on any large areas of disturbed, bare soils. This is not necessary around poles (structures) where the bare soil might only be a metre or two in radius.
- If any protected trees are encountered that need to be removed or de-limbed, then the relevant permits need to be obtained from the relevant government departments.
- The National List of protected trees as well as relevant provincial lists must be checked. For protected trees on the National list, permits should be obtained from the relevant provincial office of the Department of Agriculture, Forestry and Fisheries (DAFF). For protected trees on the provincial list (specific to each province), permits should be obtained from the relevant provincial nature conservation departments. In some areas it is possible that the permits need to be obtained from the same department. These departments and permit sections tend to fall under different governing bodies for the different provinces. However, it is important that a botanist first be commissioned to verify or determine if protected trees do really occur in the development area, what they are and to gps the exact location of each tree.
- National list and permits take pre-eminence over provincial. In other words, if application is done for a permit on a national level for a listed species, then do not have to apply for the same species on a provincial level.

14 Alien Invasive Management Plan

- All invasive species have to be removed, as stipulated by CARA (Act No 43 of 1983), and an on-going monitoring programme implemented. This monitoring plan can be incorporated into the routine inspection activities.
- No weeds to grow around newly erected structures.
- No weeds to grow in disturbed (rehabilitated) soils
- No herbicides to be used on aliens. Aliens to be removed mechanically.
- Mechanical control to be of such a nature as to allow local, indigenous grasses and other pioneers to colonise the previously disturbed areas, thereby keeping out alien invasives.

15 Protection of Fauna

- Construction activities shall not interfere or cause fatalities to animals (both wild and farm animals);
- No interference with livestock shall occur without the landowner's written consent and with the landowner or a person representing the landowner being present;
- The breeding sites of raptors and other wild birds species in close proximity to the site must be taken into consideration during the planning of the construction programme;
- Breeding sites shall be kept intact and disturbance to breeding birds shall be avoided. Special care shall be taken where nestlings or fledglings are present;
- Special recommendations of the faunal specialist must be adhered to at all times to prevent unnecessary disturbance of fauna;
- No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as No-Go area.

16 Protection of Avi-fauna

- The breeding sites of raptors and other wild bird species have to be taken into consideration during the planning of the construction programme.
- It is therefore imperative that the breeding sites of these birds are kept intact and that the breeding pairs are not disturbed especially where there are young nestlings.
- If any new sites or nests which were not known or noted before are found during the construction process, each site has to be assessed for merit and the necessary precautions taken to ensure the least disturbance.
- Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable.

17 Protection of Heritage Resources

- Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in Section 3: No-Go areas;
- Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance;
- It should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts is always a distinct possibility. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence and adapt this report.
- The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA.
- If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed.

18 Palaeontology

If any palaeontological material is exposed during digging, excavating, drilling, or blasting SAHRA/PHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

19 Safety of the public

- Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.;

- All unattended open excavations shall be adequately fenced or demarcated;
- Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding;
- Ensure structures vulnerable to high winds are secured;
- Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged. to remove/collect such material before construction recommences.

20 Sanitation

- Mobile chemical toilets are installed onsite if no other ablution facilities are available;
- The use of ablution facilities and or mobile toilets shall be used at all times and no indiscriminate use of the veld for the purposes of ablutions shall be permitted under any circumstances;
- Ablution facilities shall be located within 100 m of any work place and shall be numerous enough to accommodate the workforce (minimum requirement of 1:15 workers on site).

21 Prevention of disease

- Undertake environmentally-friendly pest control in the camp area;
- Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS;
- The Contractor shall ensure that information posters on AIDS are displayed in the Contractor Camp area;
- Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable;
- Free condoms will be made available to all staff on site at central points;
- Medical support shall be made available;
- Provide access to Voluntary HIV Testing and Counselling Services.

22 Emergency Procedures

- Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project;
- The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation;
- All staff shall be made aware of emergency procedures as part of environmental awareness training;
- The relevant local authority shall be made aware of a fire as soon as it starts;
- In the event of emergency necessary mitigation measures to contain the spill or leak shall be implemented (see Hazardous Substances Section 23.)
- Clear lines of communication to be established and communicated to employees for use should such emergencies occur.
- Emergency contact details for the different potential emergencies to be displayed in several strategic areas.
- Emergency drills to be done; the Contractor must establish the frequency at which the drills must be done.
- Emergency drill report must be developed and filed and areas of improvement must be identified and improved upon.
- The Contractor must determine whether the emergency telephone numbers displayed are correct and operational. Actions to be taken in the event of different types of emergencies to be made clear to employees.

23 Hazardous substances

- The Occupational Health and Safety Act No 85 of 1993 to be complied with at all times;
- The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible;
- All hazardous substances will be stored in suitable containers as defined in the Method Statement;
- Containers will be clearly marked to indicate contents, quantities and safety requirements.

- All storage areas will be bunded. The bunded area will be of sufficient capacity to contain a spill / leak from the stored containers;
- An Alphabetical Hazardous Chemical Substance (HCS) control sheet will be drawn up and kept up to date on a continuous basis. All hazardous chemicals that will be used on site will have Material Safety Data Sheets;
- All employees working with HCS will be trained in the safe use of the substance and according to the safety data sheet;
- Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment (PPE) must be made available;
- The Contractor shall ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers;
- The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall);
- The floor of the bund shall be sloped, draining to an oil separator;
- Provision shall be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray shall be used to ensure small spills are contained;
- All empty externally dirty drums shall be stored on a drip tray or within a bunded area;
- No unauthorised access into the hazardous substances storage areas shall be permitted;
- No smoking shall be allowed within the vicinity of the hazardous storage areas;
- Adequate fire-fighting equipment shall be made available at all hazardous storage areas;
- Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit shall be used. Appropriate ground protection such as drip trays shall be used as well;
- An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance shall be available at all times;
- The responsible operator shall have the required training to make use of the spill kit in emergency situations;
- In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Section 9 for procedures concerning waste water management and Section 10 for solid waste management.

24 Workshop, equipment maintenance and storage

- Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area;
- During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil
- Leaking equipment must be repaired immediately or be removed from site to facilitate repair;
- Workshop areas must be monitored for oil and fuel spills and such spills;
- Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place shall be available;
- The responsible operator of equipment must have the required training to make use of the spill kit in emergency situations;
- The workshop area shall have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed;
- Water drainage from the workshop are shall be contained and managed in accordance Section 9: Waste water management

25 Batching plants

- Concrete mixing shall be carried out on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface);

- Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination;
- Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains;
- A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted;
- Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility;
- Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site in appropriate containers;
- Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer to Section 26: Dust emissions)
- Any excess sand, stone and cement must be removed from site on completion of construction period and disposed at a registered disposal facility if it cannot be reused;
- Temporary fencing shall be erected around batching plants in accordance with Section 6: Fencing and gate installation.

26 Dust emissions

- Take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO;
- Removal of vegetation shall be avoided until such time as soil stripping is required and similarly exposed surfaces shall be revegetated or stabilised as soon as is practically possible;
- Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present;
- During high wind conditions, the ECO will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level;
- Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind. Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ECO;
- Vehicle speeds shall not exceed 40km/h along dust roads or 20km/h when traversing unconsolidated and non-vegetated areas;
- Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather in summer. Such measures shall also include the use of temporary stabilising measures (e.g. chemical soil binders, straw, brush packs, chipping);
- Any blasting to be done after informing local public;
- Any blasting activity shall be conducted by a suitably licensed blasting contractor;
- For significant areas of excavation or exposed ground, spray water or wet areas using trucks to minimise the spread of dust.

27 Traffic Management Plan

- Property owners that would be affected by the construction should be consulted prior to the construction phase with regards to the construction schedules, transportation corridors, construction of additional access roads and construction methods to be used.
- The Holder of the authorisation should keep the construction of access roads to a minimum and rather use the existing infrastructure, as the construction and maintenance of these roads are very costly, impact on the residents' daily living and movement patterns, and create a potential for erosion.
- Rehabilitation of new access roads for construction vehicles should be undertaken as soon as the construction process allows.

- There should be strict adherence to speed limits when using local roads and when travelling through residential areas.
- Access corridors and access points for heavy construction vehicles should be indicated to warn motorists of the movement of these vehicles.
- Limit the movement of construction vehicles to off-peak periods (where possible).
- Limit the movement of construction vehicles in areas where sensitive receptors are situated e.g. schools and pedestrians.
- Construction hours will be restricted to specific periods, which exclude Sundays and public holidays.
- All complaints received with regards to poor conduct of construction personnel, malfunction of or damage to structures; etc. will be investigated by the applicant in co-operation with all the relevant stakeholders.
- The existing complaints structure must be revised by the applicant and be updated on a regular basis and communicated with all the affected landowners to ensure effective response and service supply.
- A list of all names, telephone numbers and addresses of the relevant employees, contractors and all affected landowners must be compiled and regularly updated and distributed to everyone to ensure sufficient communication channels in case of emergency and where access is required for maintenance purposes.

28 Noise

- Operating hours as determined by the environmental authorisation are adhered to during the construction phase. Where not defined, construction shall be limited to daylight hours;
- Conduct noise monitoring tests, as required by the ECO or environmental authorisation;
- Noise levels are to comply with ECA's 7dB rule i.e. cannot generate noise that increases the noise levels to 7db above the current ambient.

29 Fire Prevention

- The statutory requirements of provincial ordinances, municipal by-laws and the National Veld and Forest Fire Act 101 of 1998 have to be complied with.
- Designate smoking areas where the fire hazard could be regarded as insignificant;
- Educate workers on the dangers of open and/or unattended fires;
- No open fires shall be allowed on site under any circumstances;
- Firefighting equipment shall be available on all vehicles located on site;
- The local Fire Protection Agency (FPA) must be informed of construction activities;
- Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site;
- Two way swop of contact details between ECO and FPA
- Proper provision for portable gas stoves should be made. All relevant laws related to flamable substances to be strictly adhered to.
- Cooking fires can only be made in controlled designated areas that are assessed prior to use.
- Contractor employees to be trained on fire fighting and fire emergency drills have to be done to determine readiness in case of emergency.
- The Contractor has to take all reasonable and appropriate steps to avoid increasing the risk. Daily Risk Assessments and or Toolbox Talks also to indicate the importance of abiding by the rules of not making open fires.
- A firebreak has to be created in high risk areas such as camp sites and material storage areas.

30 Stockpiling and stockpile areas

- All material that is excavated during the construction phase (either during piling (if required) or earthworks) shall be stored appropriately on site in order to minimise impacts to watercourses, wetlands and water bodies;

- Stockpiles must be located at least 10 m away from storm water channels and drains, and at least 32 m away from any watercourse, water body or wetland, and on flat areas where runoff will be minimise;
- All stockpiled material shall be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods;
- Stockpiles shall not exceed 2 m in height;
- During periods of strong winds and heavy rain, the stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin etc.);
- Where possible, sandbags (or similar) should be placed at the bases of the stockpiled material in order to prevent erosion of the material.

31 Civil Works

- Where terracing is required, topsoil must be collected and retained for the purpose of re-use later to rehabilitate disturbed areas not covered by yard stone;
- Areas to be rehabilitated include terrace embankments and areas outside the high voltage yards;
- Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled;
- These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly;
- Rehabilitation of the disturbed areas shall be managed in accordance with Section 35: Landscaping and rehabilitation;
- Any blasting activities must be controlled and executed by a licensed person. Blasting activities must be well communicated with Landowners and nearby communities and all livestock must be moved from the area;
- All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a legally operated landfill site;
- Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes;
- Under no circumstances may any illegal / hazardous substances or materials be dumped with topsoil and used during landscaping.

32 Excavation of foundation and drainage systems

- All excess spoil generated during foundation excavation must be disposed of in an appropriate manner and at a legally operated landfill site, if not used for backfilling purposes;
- Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes;
- Management of equipment for excavation purposes shall be undertaken in accordance with Section 24: Workshop equipment maintenance and storage;
- Hazardous substances spills from equipment shall be managed in accordance with Section 23: Hazardous substances.

33 Installation of foundations and drainage systems

- Batching of cement to be undertaken in accordance with Section 25: Batching;
- Residual solid waste shall be recycled or disposed of in accordance with Section 10: Solid Waste Management.

34 Emergency repairs

Due to breakages of equipment shall be managed in accordance with Section 24: Workshop equipment maintenance and storage and Section 22: Emergency procedures.

35 Landscaping and rehabilitation

- All areas disturbed by construction activities shall be subject to landscaping and rehabilitation;
- All spoil and waste will be removed to a registered waste site and Certificates of disposal provided;
- All slopes in excess of 2% (1:50) must be contoured in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983;
- All slopes in excess of 12% (1:8.3) must be terraced in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983;
- Indigenous species will be used for replacing;
- Stockpiled topsoil shall be used for rehabilitation (refer to Section 30: Stockpilling and stockpiled areas);
- Stockpiled topsoil will be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion;
- Before placing topsoil, all visible weeds from the placement area and from the topsoil shall be removed;
- Subsoil shall be ripped before topsoil is placed;
- The project shall be timed so that rehabilitation can take place at the optimal time for vegetation establishment;
- Where impacted through construction related activity, all sloped areas must be stabilized to ensure proper rehabilitation is effected and erosion is controlled as per instruction from the ECO;
- Sloped areas stabilized using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specification must be adhered to implemented strictly;
- Where required, re-vegetation can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following:
    - Annual and perennial plants are chosen.
    - Pioneer species are included.
    - Species chosen must grow in the area without any problems.
    - Root systems must have a binding effect on the soil.
    - The final production should not cause ecological imbalance in the area.

Project specific environmental controls

1 Heritage Resources

- No sites of cultural heritage significance were identified.
- Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed.
- If any evidence of archaeological sites or remains (eg, remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations), unmarked human burials, or other categories of heritage resources are found during the proposed activities, SAHRA APM Unit (021 462 4502) must be alerted immediately, and a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological significance, a Phase 2 rescue operation might be necessary.

2 Open Zones

The 32 meters regulated area (Erf 451) is zoned “Public Open Space”. This area should remain as conservation area in its natural state, be managed and maintained in accordance to the requirements of the City of Tshwane Environmental Department and no development/or transformation of the area be considered in future.
Only indigenous and preferably endemic plant species will be allowed for the proposed development’s manicured gardens and for rehabilitation purposes.

According to Tshwane Open Space Framework (TOSF), no development will be allowed within the 1:50 year flood line and the amendment of the 1:50 year flood line by infilling, will not be supported due to the resulting cumulative negative impacts on riverine and riparian systems.

For the construction, operation, maintenance and management for the controlled release of stormwater, including stormwater attenuation structures, sewage reticulation system, water supply network, electrical supply, roads, any buildings (no new roads or buildings are within the regulated area), fences and or any other activity that is within the Boepensspruit (watercourse) as proposed for the development will require a Water Use License Application (WULA) in terms of the National Water Act. No excavation or construction shall be permitted within the 1:100 year flood line without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation.

General measures:

- The planned open space area must be fenced off prior to commencement of the construction phase
- No construction vehicles may be allowed within the open space area
- No stock-piling of soils are allowed within the open space area
- No lay down areas are allowed within the open space area
- No temporary facilities are allowed within the open space area
- No temporary dumping allowed in the open space area
- Access must be controlled to the open space in terms of fencing and gates (not necessary for gates to be locked)
- Erosion control and alien weed control is required as part of the rehabilitation process during the construction phase and as part of the operation and maintenance phase
- No indigenous plants within the open space are allowed to be removed by residence
- Litter must be controlled and monitored
- Adequate rubbish bins must be provided in the open space
- During the summer months general movement within the stream and the 32m regulated area by vehicles and people must be restricted and limited to avoid disturbing small wild animals, including possible breeding birds along the stream.

3 Measures to Protect Hydrological Features

- The study area is situated within the primary drainage area (PDA) of A, and the quaternary drainage areas (QDA) of A23E. The study area is within the Crocodile (West) & Marico West Management Area (WMA 3) and under the jurisdiction of the Limpopo Catchment Management Agency (CMA 1).
- The small, semi-perennial stream, the Boepensspruit, flows all along the western boundary of the study site, with some of the riparian vegetation within the edge of the site. The original flow and channel of the Boepensspruit (stream) has been altered. The floodplain of the stream is very wide south / southwest of the study site, but then gets channelled very narrowly into stormwater culverts that run under the road (1st Ave) and then stays in a deep, narrow channel all along the western boundary of the study site.
  The following mitigation measures are recommended:
  - No temporary facilities, temporary accommodation or temporary storage sites to be erected within 50m of any watercourse.
  - No portable toilets to be positioned within the 32m regulated zone of the watercourse/s.
  - Ensure a proper Stormwater Management Plan is compiled and implemented.
  - Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left.
  - All hazardous materials such as but not limited to paint, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the terrestrial and water environments.
  - All construction material, equipment and any foreign objects brought into the area by contractors and staff to be removed immediately after completion of construction.
  - Removal of all waste construction material to an approved waste disposal site.

- Care should be taken at construction sites to store hazardous substances, such as fuel, and oil appropriately, not allowing these substances to enter watercourses.

3 Vegetation

No red data (endangered & threatened) species were observed during field investigations. Two Orange Data Plant species (*Gladiolus eliotii & Aloe greatheadii*) were observed in the study area. *Aloe greatheadii* and *Gladiolus eliotii* plants need to be lifted and replanted within the public open space (green zone).

4 Protected Trees

There are no protected trees in the study area.

5 Fauna

No priority faunal species (which includes red data species) were encountered during field investigations.

6 Avifauna

Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable. During construction no trees with active bird nests or active burrows in the ground may be disturbed. These must be cordoned off and an ecologist /ECO must first inspect and give site-specific recommendations. During the summer months general movement within the stream and the 32m regulated area by people must be restricted and limited to avoid disturbing possible breeding birds along the stream.

7 No-Go areas

From an environmental perspective, the site has a certain degree of ecological sensitivity due to the presence of the Boepenspruit that flows southwest and west of the study area. The stream is just outside of the boundaries of the study area. The 50-year and 100-year floodlines are also mostly outside of the actual study site. Only a small portion is within the south western border of the site. This small section is completely within the 32m regulated zone. The 32 metres regulated zone will be excluded from the development and maintained as public open space. This regulated area is determined to be a 'No-Go' zone and need to be avoided completely in terms of proposed developments as per the project's designs and layouts. Mitigating measures must also be implemented.

Mitigation Measures:

- No temporary facilities, temporary accommodation or temporary storage sites to be erected within 50m of the any watercourse.
- No portable toilets to be positioned within the 32m regulated zone.
- Only existing roads to be used by heavy vehicles during construction as far as possible.
- No excess imported soils or stone (if used during the construction phase) may be left behind. These materials to be removed immediately on completion of the project or activity.
- Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left.
- All hazardous materials such as but not limited to paint, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the groundwater and watercourses.
- All construction material, equipment and any foreign objects brought into the area by contractors and staff to be removed immediately after completion of construction.
- Removal of all waste construction material to an approved waste disposal site.
- Proper rubbish/waste bins to be provided. These to be emptied weekly and the waste to be removed to an official waste disposal site.

- All vehicle and machinery tracks and disturbed areas to be rehabilitated immediately after the construction phase.
- Ensure a proper Stormwater Management Plan is compiled and implemented.
- Avoid and minimise the removal of any indigenous trees.
- Access roads for heavy vehicles to be limited.
- No movement of construction workers or vehicles outside of study area boundaries.
- Dust control to be implemented during the construction phase.
- No movement of vehicles or contractors allowed within the 32m regulated zone.
- *Aloe greatheadii* and *Gladiolus eliotii* plants need to be lifted and replanted within the public open space (green zone).

8 Stormwater

- Storm water drainage must be in accordance with the Water Research Commission Report, 2012 and the South African Guidelines for Sustainable Drainage Systems.
- It is recommended to construct a stormwater pipe system as per City of Tshwane's requirements. As and when each individual stand is developed, stormwater management plans need to be done and approved by Council.
- A storm water management method statement must be developed and approved for use.
- Ensure stormwater runoff is probably diverted and channelled.
- Stormwater run-off should be appropriately managed so as not to alter the timing and intensity of flows entering the watercourse under the natural condition.
- No storm water or surface runoff should accumulate or pond within 1.5m of the structures. Services and plumbing precautions must be put in place to ensure that underground services are not disrupted by the heaving action of expansive in situ soils.
- It is assumed that if stormwater is properly managed during construction, erosion will not become a major problem.
- In addition to properly managing stormwater, methods to prevent and contain erosion such as geo-textiles and silt fences should be used on exposed slopes.
- Any inlet to the piped stormwater system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be done immediately on installation of the piped system.
- The study area is affected by a 1:100 year flood line. The 50-year and 100-year floodlines are mostly outside of the actual study site. Only a small portion is within the south western border of the site. Should storm water be discharged into the Boepens Spruit it will require a General Authorisation or Water Use License Application in terms of the National Water Act. In addition, any civil services to be developed in the flood line area will require authorization.

9 Dust

Appropriate dust suppression measures must be implemented during the construction phase, as the site is very close to residential areas.

10 Geology

A Phase 1 Geotechnical investigation was conducted by Soilkraft CC. The findings are summarised as follows:

The property is regarded as being of intermediate favourability for the proposed development. The following issues must be taken into account:
Geology: Trial holes suggest that the site is underlain by thick successions of alluvium, largely originating from residual norite. No bedrock was encountered.
Soil Profiles: Soil profiles on the site consisted of colluvial soil cover overlying multiple horizons of alluvium. All material test samples proved to be either highly expansive or very highly expansive.
Groundwater: No seepage or perched water was encountered in any of the trial holes; however, it is expected

that perched water levels or seepage water may occur during years of high rainfall. Such seepage water will be dictated by the adjacent non-perennial water course.
Founding Conditions: The entire site is classified as H3, indicating that unrestrained heave in excess of 30mm is expected.
Conditions of Excavation: Conditions of clayey excavation dominate the site. Trial holes were excavated to depths between 240mm and 2700mm and not refusal of excavation was encountered in any of the excavations made.
Soil Corrossivity: Conditions of extremely corrosive soils must be anticipated.
Dolomite Stability: The site is not located on dolomitic land.
Seismicity: A 10% probability exists that an earthquake with Peak Ground Acceleration of 0.12g to 0.16g may take place once in 50 years.

Recommendations
Proposals for Founding and Construction
Founding in this area may be done by means of a reinforced raft or soil replacement raft, depending on which option is most cost effective. The exact amount of heave to be accommodated on individual erven must be determined during the phase two geotechnical investigation, but a general guideline is that between 60mm and 100mm of heave should be anticipated. The superstructure should also have reinforced masonry and articulation joints, as per the engineering design.
It is critical that site drainage and storm water be planned carefully to ensure efficient drainage. No storm water or surface runoff should accumulate or pond within 1.5m of the structures. Services and plumbing precautions must be put in place to ensure that underground services are not disrupted by the heaving action of expansive in situ soils.

Conditions of Excavation
General recommendations on excavation are given below, based on the parameters of "Conditions of Excavation" as per SANS 1200. The following is recommended:
Colluvium: Colluvial materials should best be excavated by machine. While hand excavation will be possible, the cohesive nature of the material would make it difficult to excavate by hand.
Alluvium: As with the colluvium, all alluvial soils should best be excavated by machine and hand excavation is not recommended.
Clayey Excavation: Provision should be made for the excavation of clayey, cohesive soils.
Depth of Excavation: The general guideline in this regard is that excavation by backhoe was proven to depths between 2400mm and 2700mm without encountering refusal of excavation when using a backhoe.
Excavation Stability: Provisions must be made to ensure excavation stability. The safety of all persons working in or near open excavations must be ensured. It is recommended that provision be made for bracing, shoring or battering of excavation walls to mitigate expected instability.
Seepage Water: It must be anticipated that excavations may be affected by water ingress during years of high rainfall.

Seismicity
The risk of a seismic event occurring is within bounds of the SANS634 specification.

Soil Corrosivity
In situ materials must be considered extremely corrosive. As such, it is recommended that provision be made to protect metallic objects (e.g. services, utilities, etc.) installed below ground level. The use of PVC or protectively coated materials may be considered, but should also take into account the expansive nature of in situ soils.

11 Civil Services

The subject property is subject to a 1:50 and 1:100 floodline as certified on the township layout plan. The area affected by the floodline was accommodated in a 'Public Open Space' property and will therefore not form part of

the housing development. Any civil services to be developed in the flood line area will require a General Authorisation or Water Use License Application in terms of the National Water Act.

12 Wayleave Requirements

As services needs to be installed within the existing road reserve, Wayleave approval must be obtained from the Roads & Stormwater Department of the City of Tshwane before any construction / locating of existing services commences.

13 Traffic - Access Arrangements

First Avenue is not constructed to the standards and specifications of CoT, but will be upgraded. The access road and new road upgrades will be designed and constructed according to the Standards and Specifications of CoT.

14 Control of alien invasive species

There are a number of alien plants in the study area. The herbaceous plants are especially prevalent in disturbed areas. Tree species such as syringa (*Melia azedarach*) and eucalyptus (*Eucalyptus spp.*) are also present. Alien plant species, some of which are invasive, occur scattered throughout the area, especially in disturbed areas. The alien plant species encountered in the study area are recorded, along with their category rating, in Table 6. The categories are as set out in the Conservation Act of Agricultural Resources Act, 1983 (CARA) (Act 43 of 1983). These species must be eradicated and controlled as per their CARA categories.

Table : Alien plants identified in the study area

Botanical Name	Common Name	Category
Argemone ochroleuca	White-flowered Mexican poppy	1
Bidens pilosa	Blackjacks	-
Campuloclinium macrocephalum	Pom pom weed	1
Conyza canadensis	Horseweed fleabane	-
Datura ferox	Large thorn-apple	1
Eucalyptus spp & cultivars	Gum trees; Eucalyptus	2
Lantana camara	Lantana	1
Melia azedarach	Syringa	3
Opuntia ficus-indica	Prickly pear	1
Solanum elaeagnifolium	Silverleaf bitter apple	1
Tagetes minuta	Khakibos, kahki weed	-
Verbena bonariensis	Vervain	-

Declared weeds and invaders are ascribed to one of the following categories:

- **Category 1: Declared weeds**
  - Prohibited plants on land and water, which must be controlled and eradicated. These plants have no economic value.
- **Category 2: Declared invader plants with a commercial or utility value**
  - May be grown in demarcated areas under controlled conditions. Need a permit and steps need to be taken to prevent their spread.
  - Prohibited within 30m of 1:50 year flood line of watercourses (except where authorised).
- **Category 3: Mainly ornamental plants**
  - Plants currently growing that have become invasive in the wild and may no longer be planted (except with special permission).
  - Existing plants may be retained, except within the flood line of watercourses (including wetlands) or as directed by the executive officer. Remaining plants must be prevented from spreading.
  - Prohibited within 30m of 1:50 year flood line of watercourses (except where authorised).

- No trade allowed in propagative material of these plants.

Control Guidelines

Control guidelines outline the overall approach to minimise and manage the probability of invasive alien plants becoming established and ensuring that any outbreaks are dealt with quickly and decisively in an effort to ensure that they do not become a long-term problem on site. The establishment of any dense infestations will be expensive and difficult to completely eradicate and will require more complex control measures than would be necessary for low-density invasions and routine maintenance.

Prevention

A prevention and maintenance strategy should be established from the beginning, during the construction phase of the project. Regular monitoring, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas all form part of a prevention strategy.

Early identification and eradication

Monitoring plans should be developed which are designed to catch Invasive Alien Plant Species shortly after they establish on the site. When new Invasive Alien Plant Species are spotted an immediate response of locating the site for future monitoring and either hand-pulling, pre-seed set early slashing of the weeds, etc. (mechanical control), or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site and thus problematic.

Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. Chemical control should not be used within 100m of the edge of any watercourse, including drainage lines and wetlands. The key is to ensure that no invasion species get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term.

Construction Phase Management

The following management actions are recommended to minimise soils and vegetation disturbance during the construction phase, reduce the probability that invasive alien plants become established on site, and generally controlling invasive weeds from the beginning of the project.

Activity	Frequency
Clearing of vegetation to be minimised to reduce footprint and bare, disturbed areas. To be monitored by Contractors and ECO	Ongoing
Care must be taken to avoid the introduction of new alien invasive plant species onto the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed, or slashed. To be monitored by the Contractor and ECO	Ongoing
ECO to specifically survey site once a month to detect aliens and have them removed. This activity with recommended measures should be noted in the EMPr as well as in short reports and checked to ensure that it is done.	Monthly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period. To be monitored by the Contractor and ECO.	Ongoing
The alien plant removal and control method guidelines should adhere to 'best practice' for the species concerned. Such information can be obtained from the Working for Water website as well as herbicide guidelines. Herbicides (weed-killers) should not be used within 100m of the edge of any watercourse.	Ongoing
Clearing activities must be contained within the affected zones and may not spill over into	Ongoing

adjacent no-go areas, such as floodplains. No-go areas should be clearly demarcated prior to construction. These would include wetland areas and watercourse floodplains.	

Operational / Maintenance Phase

The following management measures are aimed at maintaining non-invaded site areas clear of invasive alien species, reducing abundance of weeds present and limiting the potential for new invasive weeds becoming established before the natural vegetation has the change to fully recover and thereby help to keep out alien plant species.

Activity	Frequency
Conduct surveys for weeds and remove those identified on site.	Every 3 months for at least 2 years
Revegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place.	6 months. Vegetate at start of rainy season
No alien species are to be planted on site. If vegetation is required for rehabilitation and aesthetic purposes, then non- invasive locally indigenous species must be used. This includes grasses. A botanist or ecologist must verify the species to be used.	Whenever necessary / during routine maintenance
During routine maintenance eroded sites along the project should be rehabilitated. This will also assist in reducing the potential establishment of alien, invasive species	Routine maintenance

Control Methods

Various methods to control invasive plant species do exist. Basic descriptions of the various methods are discussed below.

Mechanical Control

Mechanical control involves the physical or mechanical removal or destruction of the plant. Different techniques could be used, such as uprooting, felling, slashing, mowing, ring-barking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not root easily from cuttings (coppice) after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides, following the mechanical method. Mechanical control is labour-intensive and therefore can become expensive. For this project, hand-pulling or slashing would be the most appropriate methods, since there are no existing dense stands of invasive alien plants. In the case of the need to remove alien trees, of which there are a few, the stump will need to be treated after being cut down to kill the roots and prevent resprouting. The advantages and disadvantages are shown in the table below.

Table : Advantages and disadvantages of Mechanical Control

Advantages	Disadvantages
Effective in small areas or isolated patches with low infestation levels.	Not entirely effective over the short-term or 'once-off' application, especially in densely infested areas.
Job creation potential.	Labour intensive.
No contamination of water or soils.	Time consuming.
No use of poisons that might kill nearby indigenous plants or potentially poison insects or other animals.	If no herbicides are used then the manual control techniques must be very well executed to ensure success.
Much more environmentally friendly than chemical control.	
No strict permits or applications required as in the case of herbicides.	

Chemical Control

Chemical control should only be used as a last resort, since it is hazardous for natural flora and fauna. It should not be necessary, if regular monitoring is undertaken from the start of the project, which should be effective for controlling invasive alien plants.

Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must have a basic understanding of how herbicides function. The use of inappropriate herbicides and the incorrect use of the appropriate herbicides are wasteful, expensive practices and often do more harm than good, especially when working close to watercourses. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem.

Contractors using herbicides are required to have a permit according to Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947).

Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a particular group of plants, e.g. those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present (Hoare, 2004, Bromilow, 2010).

Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape and paint). The advantages and disadvantages are shown in the table below.

Table : Advantages and disadvantages of Chemical Control

Advantages	Disadvantages
If done properly can usually compliment mechanical control efforts.	High risk to also kill indigenous flora, as well as a risk to local fauna in some instances.
Often achieve results within a short period of time (few weeks)	Herbicides are very expensive.
Large areas can be treated quickly.	Use near water has the real potential of contamination and risking the health of humans as well as animals.
Not near as labour-intensive as mechanical control	Specialized training and certification is required for use of herbicides.
Not as time consuming as mechanical control.	Not as environmentally friendly as mechanical control.

Biological Control

Biological weed control consists in the use of the natural enemies of a particular invasive weed, to reduce its vigour and reproductive potential. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species (Hoare, 2004; Bromilow, 2010).

However, biological control is not a viable option for the project and is therefore not discussed further or recommended.

OPERATIONAL PHASE

1 General rehabilitation plan

The rehabilitation plan is not only for the proposed development areas, but also for the proposed open space / green zone area.

The following form part of the rehabilitation plan:

- A stormwater plan must be compiled and implemented.

- Erosion monitoring and control must be implemented as part of the construction phase and rehabilitation in this regard must be ongoing within the construction phase. Monitoring and rehabilitation must also take place during the maintenance phase. Special attention must be given to areas in the south and east, close to the stream. Fortunately, the area is fairly flat and erosion is not seen as a potentially becoming a major problem.
- All disturbed and denuded areas arising during the construction phase must be rehabilitated and re-vegetated using indigenous plants, seeds and grasses. Only locally indigenous species to be used.
- General litter must be monitored and controlled during the construction phase and is seen as part of the rehabilitation phase.
- All foreign building materials brought onto site during the construction phase must be removed immediately after construction and must be seen as part of the construction phase and must be the full responsibility of the building contractor.

Grass Seed Mixes for Rehabilitation

The information below is a guideline and may need to be adjusted slightly depending on the availability of seed species and volumes. No alien plant species should be used for rehabilitation purposes, including grasses. Tef (*Eragrostis tef*) is often used for roadside rehabilitation, but it is not indigenous. All of the grass species in the tables below are indigenous to the study area and establish and grow well in disturbed areas and are effective in reducing erosion.

Table : Summer grass mix and application rate

Grass Species	Common Name	Application Rate
Eragrostis curvula	Weeping love grass	8 kg / ha
Setaria sphacelata var. *torta*	Creeping bristle grass	8 kg / ha
Cynodon dactylon	Couch grass	4 kg / ha
Aristida congesta	Spreading three-awn grass	7 kg / ha
Total	**-**	**27 kg / ha**

Table : Winter grass mix and application rate

Grass Species	Common Name	Application Rate
Eragrostis curvula	Weeping love grass	10 kg / ha
Aristida congesta	Spreading three-awn grass	10 kg / ha
Cynodon dactylon	Couch grass	10 kg / ha
Total	**-**	**30 kg / ha**

The contractor may determine the type of fertiliser or soil-improvement material to be added. The fertiliser can be supplied in granular form during preplant preparation of the area, although it is also normally applied in liquid form. Fertilizers used should ideally have a higher percentage of Nitrogen (N) and Phosphorus (P) than that of Potassium (K). The first two macro-elements facilitate leaf and root growth, respectively, while Potassium is more important in terms of fruit and seed production.

During soil preparation the ground must not be compacted by heavy machinery. It is also not recommended to completely level and smooth out the ground before seeding. Slight riffles in the soil and lose soils have be found to recover and re-vegetate quicker.

DECOMMISSIONING

It is not envisaged that the proposed development will be decommissioned.
It is generally assumed that the decommissioning process is the reverse of the construction process and as such the indicated impacts will also be relevant to decommissioning phase.

CONCLUSION

At a project level, EMPrs should be prepared following an EIA and incorporate the proposed management actions (i.e. actions to mitigate negative impacts and enhance positive benefits).
To ensure implementation of this EMPr, proper works planning is critical. Continual environmental awareness conducted on the work force can instil an environmental consciousness which is required amongst all employees. The principle of monitoring and continual improvement has to be one of the core principles implemented by the construction management.

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