EON Consulting

Environmental Management Programme:
Construction of a Bulk Water Supply
Pipeline for the R21 Corridor
and Surrounding Areas.

Ekurhuleni Metropolitan Municipality
October 2015

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GLOSSARY

Alien Species:
A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Applicant:
Any person who applies for an authorisation to undertake an activity or to cause such activity to be unsertaken as contEMPrlate in the National Environmental Management Act (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2006.

Aspect:
Environmental Aspect is an element of an organisation's activities, products or services that can interact ith the environment, a way in which something may be views or regarded i.e. part; feature; or phase.

Construction Phase:
The activities pertaining to the preparation for and the physical construction of the proposed development.

Contractor:
The Contractor as the developers agent on site, is bound by the Environmental Authorisation (EA) and EMPr conditions through his/her contract with the developer, and is repsonsible for ensuring that conditions of the EMPr and EA are strictly ahdered to at all times. The Contractor must comply with all orders (whether verbal or written) given by the ECO, project manager or site in terms of the EMPr

Developer:
The Developer is **EKURHULENI METROPOLITAN MUNICIPALITY,** remains ultimately responsible for ensuring that the development is implemented according to the requirements of the EMPr and the conditions of the EA throughout all phases of the project.

Environmental Manager (EM):
Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, Contractors, residents and visitors.

Environment:
The environment is defined in terms of the National Environmental Management Act, No 107 of 1998, as the surroundings within which humans exist and that are made up of – the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (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 Management Programme (EMPr):
A legally binding working document, which stipulates environmental and socio-economic itigation measures that must be implemented by several repsonsible parties throughout the duration of the proposed project.

Impact:
The positive or negative effects on human wellbeing and/or on the environment.

Indigenous:
Means a species that occurs or has historically occurred, naturally in a free state within the borders of South Africa. Species that have been introduced to South Africa as a result of human activity are excluded (South Africa (Republic) National Environmental Management: Biodiversity Act, 2004: Chapter 1).

Mitigation:
Means measures designed to avoid, reduce, or remedy adverse impacts.

Operational Phase (Post Construction):
The period following the Construction Phase, during which the proposed development will be operational.

Positive Impact:
Means a change that improves the quality of the environment.

Pre-Construction Phase:
The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase will be undertaken.

Rehabilitation:
Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement and the re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Significant Impact:
Means an impact that , by maginitude, duraton or intensity alters an important aspect of the environment.

Site Manager:
The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase. The Site Manager will liaise with the Principal Agent in order to ensure that the project is conducted in accordance with the EMPr.

Soil Compaction:
Mechanically increasing the density of the soil, vehicle passage or any other type of loading. Wet soils compact easier than moist or dry soils

ABBREVIATIONS

DBAR	Draft Basic Assessmenr Report
C	Contractor
CEMPR	Construction Environmental Management Programme
CMS	Construction Method Statement
DEV	Developer
GDARD	Department of Agriculture and Rural Developement (Provincial)
DWS	Department of Water Affairs and Sanitation
EA	Environmental Authorisation
ECO	Environmental Control Officer
EMM	Ekuhurleni Metropolitan Municipality
EO	Environmental Officer
GA	General Authorisation
I & AP's	Interested and Affected Parties
MSDS	Material Safety Data Sheets
OHSA	Occupational Health and Safety Act, Act 85 of 1993
PM	Project Manager
ENG	Engineer
SABS	South Africa Bureau of Standards
SAHRA	South African Heritage Resourses Agency
SANS	South African National Standards
SM	Site Manager

1. INTRODUCTION

The project applicant - Ekurhuleni Metropolitan Municipality (EMM), is proposing the construction of a Bulk Water Supply Pipeline for the R21 Corridor and its Surrounding Areas. The proposed activity is located within the boundaries of the EMM in Pomona, Gauteng Province. The project requires an environmental authorisation from the Gauteng Department of Agriculture and rural Development (GDARD) in terms of the National Environmental Management Act (Act No 107 of 1998). The proposed activity was registered with GDARD on the 26 August 2015. This EMPr should be implemented during the construction phase of the development to ensure that environmental impact that could occur during construction are mitigated or prevented.

1.1. OVERVIEW OF THE PROPOSED PROJECT

This portion of the proposed project entails the construction of a water supply system for the R21 Corridor and surrounding areas, which includes a 22 Mega L bulk storage reservoir and pumping facility as well as connecting pipework to the existing bulk water supply.

A detailed assessment process has been followed throughout the DBAR which included thorough consultation with landowners as well as key stakeholders.

The following studies were conducted for the proposed route:

Biophysical

- Wetlands Ecological Assessment by Steven van Staden from Scientific Aquatic Services cc

This EMPR has been compiled to ensure good environmental compliance during the **pre-construction and construction phase** of the bulk water supply pipeline. The EMPr will be strictly implemented during the construction phase of the project and will be consulted regularly during the **pre-construction and construction phase** of the project.

The EMPR specifies mitigation measures for the following environmental aspects:

Pre-construction Phase

Generic pre-construction mitigation measures.

Construction Phase

- Site clearing
- Site establishment
- Construction traffic and access
- Construction camp
- Specialised construction methods
- Pile drilling
- Soils and Geology

- Erosion control
- Groundwater and Surface Water Pollution
- Hydrology and Stormwater
- Air Pollution
- Noise
- Flora
- Fauna
- Employment
- Waste Management
- Health and Safety
- Security
- Social Environment
- Visual Impact
- Cultural and Heritage Artefacts

1.2. APPLICABLE LEGISLATION AND GUIDELINES GOVERNING EMM

The pipeline will be operated and maintained according to several national and international standards including but not limited to:

- *National Fire Protection Association (NFPA)* standards
- *International Standards Organization (ISO) 9000/2000 Quality Systems*
- *South African standards, codes and regulations, which include:*
- *South African Occupational Health and Safety Act (OHASA) Act 85 of 1993*
- *South African National Standard (SANS) 10089 (pertaining to the building industry)*
- *National Environmental Management Act, Act 107 of 1998*
- *Environmental Conservation Act, 1989 (Act No 73 of 1989) (ECA)*
- *National Water Act, 1998 (Act No.36 of 1998)*
- *Constitution of South Africa 1996 (Act No. 108 of 1996)*
- *National Heritage Resources Act 1999 (Act No 25 of 1999)*
- *Protected species – provincial ordinances*
- *Conservation of Agricultural Resources Act (Act No 103 of 1997)*
- *National Environmental Management: Biodiversity Act (Act No. 10 of 2004)*
- *National Environmental Management: Air Quality Act (Act No. 39 of 2004)*
- *Atmospheric Pollution Prevention Act (Act No. 45 of 1965)*
- *Ekurhuleni Metropolitan Municipality, consolidated by-laws which are supplementary to the National Building regulations and building Standards Act, 1977 (Act No. 103 of 1977)*
- *Hazardous Substances Act, 1973 (Act No. 15 of 1973)*

1.3. Site Description

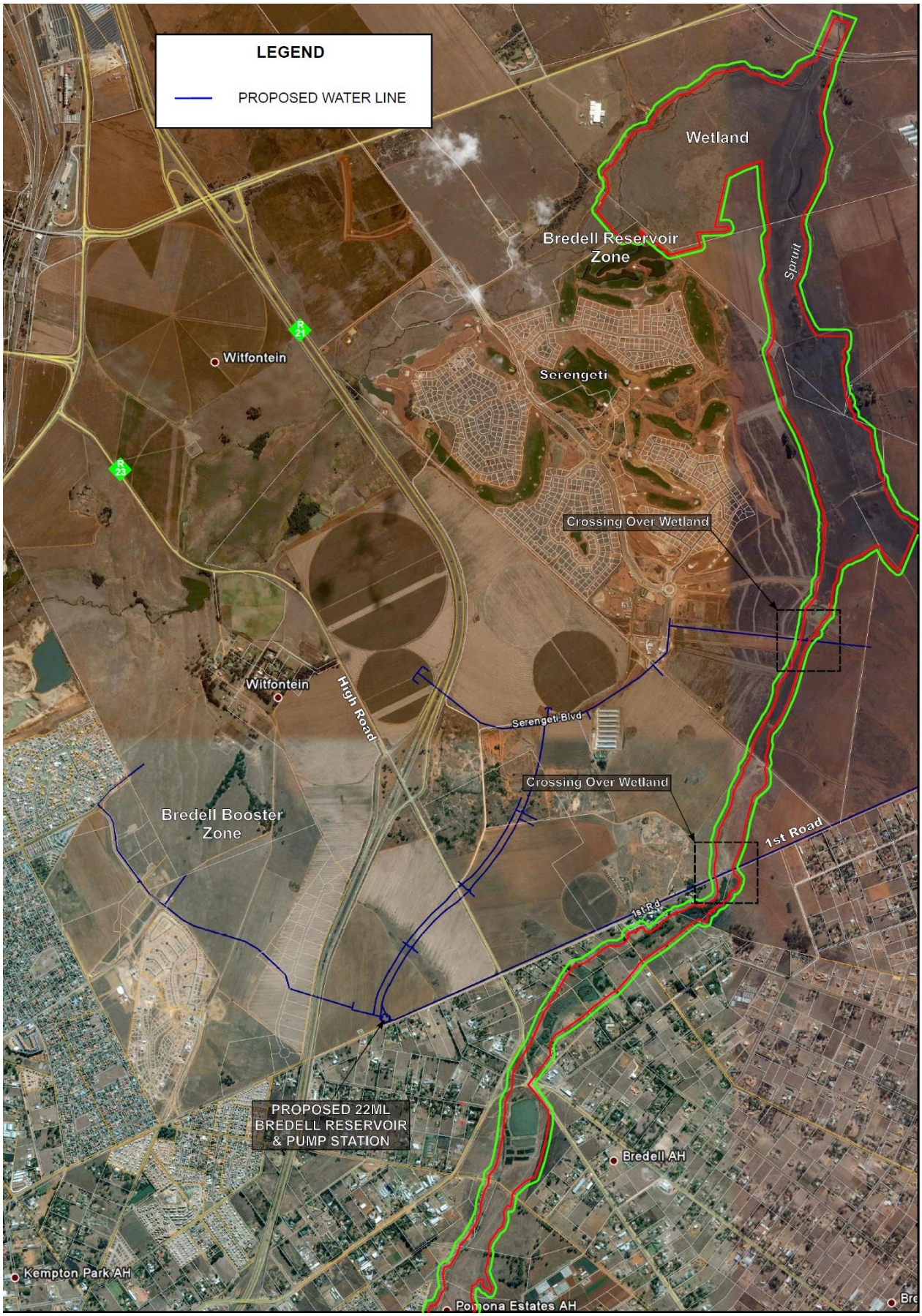

Figure 1: Locality Map

1.4. Applicable Documentation

The following documents should be read in conjunction with this EMPr.

- Draft/Final Basic Assessment Report for the proposed R21 Bulk Water Supply Pipeline, in the Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Environmental Authorisation issued by Gauteng Department of Agriculture, and Rural Development (GDARD)
- General Authorisation issued by the provincial Department of Water Affairs and Sanitation (DWS)

2. PROJECT RESPONSIBILITIES

Several professionals will form part of the construction team. The most important from an environmental perspective are the Project Manager, the Environmental Control Officer (ECO), the Contractor and the developer. An independent Environmental Auditor will be appointed by the developer.

The Project Manager is responsible for the implementation of the EMPr on the site during the **pre-construction** and **construction** phases of the project.

The ECO is responsible for monitoring the implementation of the EMPr during the design, **pre-construction** and **construction** phases of the project.

The Contractor is responsible for abiding by the mitigation measures of the EMPr which are implemented by the Project Manager during the **construction** phase.

The Applicant (Ekurhuleni Metropolitan Municipality) will be responsible for the implementation of the EMPR during the Operational and Decommissioning phase, which will be dealt with in a separate document, entitled the Operational EMPr.

2.1. Project Manager

The Project Manager is responsible for overall management of project and EMPr implementation. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the environmental Basic Assessment Report and the conditions stated within the Environmental Authorisation
- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures.
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine the construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

2.2. Environmental Control Officer

The Environmental Control Officer is responsible for the implementation of the EMPr during the construction phase. The ECO will liaise and report to the Developer, Contractor, Landowners and Authorities. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the Environmental Authorisation.
- Be familiar with the recommendations and mitigation measures of this EMPr.
- Conduct weekly / monthly audits of the construction site according to the EMPr and Environmental Authorisation
- Educate the Contractor about the management measures of the EMPr and Environmental Authorisation and Water Use General Authorisation.
- Regular liaison with the construction team and the project leader.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues as well as good compliance with the EMPr.
- All negotiations for any reason shall be between the ECO, the affected parties, the developer and the Contractor. No verbal agreements shall be made. All agreements shall be recorded in writing and all parties shall co-sign the documentation.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

Liaising with the Developer, Contractor and Authorities by the ECO will take place in the following manner:

- Weekly Inspections will be conducted by the ECO. These audits will be conducted randomly (within the week) and will not require prior arrangement with the Contractor.
- Weekly Inspections refer to above will take the form of completed audit checklists and photographic checklists. These weekly audit checklists will be appended to, and inform, the monthly consolidated audit report and
- Compilation of a monthly audit report with a consolidated rating of the compliance with the EMPR. The monthly audit report will be delivered to the Developer, Engineers and copied to the Contractors for necessary corrective action. The audit report will be submitted to the competent authority ten days after the end of the month.
- The only liaison with authorities will be submissions of monthly reports.

2.3. Contractor

The Contractor is responsible for the implementation and compliance with recommendations and conditions of the EMPr.

- Ensure compliance with the EMPr at all times during construction
- Maintain environmental registers which keeps a record of all incidents which occur on the site during construction. These incidents include:
    - Public involvement / complaints
    - Health and safety incidents
    - Hazardous materials stored on site
    - Non-compliance incidents

2.4. Environmental Officer

The EO will be appointed by the Contractor to monitor the activities on the site on a daily basis against the EMPr conditions.

- The Contractor's EO will be the responsible party for all compliance of this EMPr during the construction phase.
- The EO will be appointed by the Contractor to monitor the activities on the site on a daily basis against the EMPr conditions.
- The EO will liaise on a daily basis with the ECO on site and will report back to the ECO on any significant occurrences during all site inspections and site meetings.
- The EO will keep the ECO informed of the Contractors planned construction within areas of environmental concern such as wetlands and other sensitive areas
- All communication between these parties in this regard will be confirmed in writing via email.
- The EO must further immediately report any major incidents or occurrences to the ECO to ensure immediate remedial action

2.5. Independent Environmental Auditor

The Independent Environmental Auditor (IEA) will be appointed by the developer to conduct a monthly environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme.

The Independent environmental auditor will:

- conduct audits;
- submit audit reports to ECO and relevant authority on a monthly basis; and
- Engage specialist sub consultants when required.

2.6. Environmental Monitoring Committee (EMC)/ Community Liaison Officer (CLO)

An Environmental Monitoring Committee (EMC) will be established for the duration of the construction phase to facilitate open communication channels between the project proponent, stakeholders and I&AP's.

The EMC will consist of the following members but are not limited to:

- Applicant / Developer (EMM)
- Environmental Control Officer (ECO)
- Independent Environmental Auditor
- Main Contractor
- Authorities (as and when available)

Table 1: Responsible Parties and Auditing Process

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION	ABBREVIATION
Developer	Ekurhuleni Metropolitan Municipality	Assume ultimate responsibility	Assume ultimate responsibility	EMM
Project Management	EMM	Project management	Project management	PM
Main Contractor		Main Contractor	N/A	MC
Environmental Officer		Daily monitoring	N/A	EO
Environmental Control Officer	Environmental Impact Management Services	Two weekly to monthly audits	Annual audits	ECO
Independent Environmental Auditor	Environmental Impact Management Services	Monthly audits	Annual audits	IEA
Provincial Authority	Gauteng Department of Agriculture and Rural Development	Conduct site visits when necessary	Conduct site visits when necessary	GDARD

The following are the environmental management responsibilities of the various parties during construction and operational phases. Unless otherwise stated the EMPr will be adhered to as follows:

- The monitoring party will be the ECO.
- The scope of ECO monitoring relates to checking/auditing of Contractor's site records of monitoring and testing/analyses data.
- Method of record keeping will be weekly to two weekly audits depending on the stage of

the project.

- Audit Technique will be the review of records that will be kept on site by the ELO and/ or site inspections.
- The Developer will bear ultimate responsibility.

3. The Environmental Management Programme

This EMPr seeks to manage and keep to a minimum the negative impacts of a development and at the same time, enhance the positive and beneficial impacts

3.1. Objectives of an EMPr

The objectives of the EMPr are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels
- To identify measures that could optimize beneficial impacts
- To create management structures that address the concerns and complaints of I & APs with regards to the development
- To establish a method of monitoring and auditing environmental management practices during all phases of development
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.
- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMPr and reporting thereon.
- Specify time periods within which the measures contemplated in the EMPr must be implemented, where appropriate.

3.1.1. The EMPr seeks to highlight the following

- Avoiding impacts by not performing certain actions
- Minimising impacts by limiting aspects of an action
- Rectifying impacts through rehabilitation, restoration, etc. of the affected environment
- Compensating for impacts by providing substitute resources or environments
- Minimising impacts by optimising processes, structural elements and other design features
- Provide on-going monitoring and management of environmental impacts of a development and documenting of any digressions /good performances
- The EMPr is a legally binding document that all parties involved in the project must be made aware of.

3.1.2. Environmental Monitoring

A monitoring programme will be implemented for the duration of the construction phase of the project. This programme will include:

- Bi-weekly audits during first month where after monthly audits will be conducted by the Environmental Control Officer, which are according to the EMPr and Environmental Authorisation's conditions. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compilation of an audit report with a rating of the compliance with the EMPr. This report will be submitted to the relevant authorities (GDARD).

The ECO shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

A formal monitoring protocol will be included within the Contractor Environmental Management System Manual, as detailed in specific procedures outlined in the EMS.

In addition the requirements of the Department of Water and Sanitation in terms of the water licensing process under the National Water Act have not yet been received. These requirements, in terms of a monitoring protocol, will only be able to be incorporated into the Contractor EMS's specific operational procedures once authorisation for the relevant water use has been received.

3.1.3. Compliance with the EMPr and associated documentation

A Copy of the EMPR must be kept on site during the construction period at all times. The EMPR will be made binding on all Contractors operating on the site and must be included within the *Contractual Clauses*. It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs to the environment, human health as well as the preventative measures to reduce or prevent further pollution and/or environmental damage (The polluter pays principle).

The Contractor is deemed not to have complied with the EMPr if:

- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The Contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time,
- The Contractor fails to respond adequately to complaints from the public.

The Developer is deemed not to have complied with the EMPr if:

- Within the boundaries of the site there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The Developer fails to respond adequately to complaints from the public.
-

3.1.4. Layout of the EMPr

The EMPr is separated into two phases. Each phase has specific issues unique to that period of the development and operation of the proposed reservoir and associated infrastructure.

The two phases of the development are identified below:

- Pre-Construction Phase;
- Construction Phase and associated rehabilitation of affected environment

3.1.5. Training and Awareness

3.1.5.1. Training of Construction Workers

The Construction workers must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered during construction excavation. They must also be apprised of the EMPr's requirements.

3.1.5.2. Contractor Performance

The Contractor must ensure that the conditions of the EMPr are adhered to. Should the Contractor require clarity on any aspect of the EMPr, the Contractor must contact the Environmental Control Officer for advice.

3.1.5.3. ISO 14001 (Environmental Management System)

The EMPr guides the Construction Environmental Management System (EMS) which will follow the ISO 14001 (EMS) guidelines developed for the construction of the proposed project.

4. Environmental Management Programme: Pre-Construction Phase

Requirements for the pre-construction phase

- Proper and continuous liaison between the Developer, the Contractor and Landowners to ensure all parties are appropriately informed at all times.

- The Landowners must be informed of the starting date of construction as well as the phases in which the construction shall take place.
- The Contractor must adhere to all conditions of contract including the Environmental Management Programme. Adequate planning of the construction programme to allow for disruptions due to rain and very wet conditions.
- All manmade as well as natural (vegetation) structures outside the boundary of the servitude shall be protected against damage at all times and any damage shall be rectified immediately.
- Proper documentation and record keeping of all complaints and actions taken.
- Regular site inspections by the ECO and good control over the construction process throughout the construction period.
- Appointment of an ECO on behalf of the Developer to implement this EMPr as well as deal with all Landowner related matters.
- Independent Environmental Audits to be carried out during and upon completion of construction.
- A formal communications protocol should be set up during the construction phase. The aim of the protocol should be to ensure that effective communication on key issues that may arise during this phase be maintained between key parties such as the ECO, Project manager and Contractor. The protocol should also ensure that concerns / issues raised by I&APs are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may need to be set up. This could be done through an Environmental Monitoring Committee that would meet on a regular basis. The communications protocol should be maintained throughout the construction phase.

Table 2: Planning and Pre-construction Phase

IMPACT	PLANNING AND PRE-CONSTRUCTION PHASE This section deals with the preparation of the site and actions that need to be implemented before construction commences	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**PRE - CONSTRUCTION**	**DEV / ECO**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Appoint an Environmental Control Officer and Environmental Liaison Officer. 2. Developer and project team to review and approve the EMPr. 3. Before construction commences, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. 4. The Contractor and ECO must ensure compliance with conditions described in the Environmental Authorisation. 5. The PM is responsible for among other things; the supervision of the work and other services related to the work that is to be carried out and must ensure that it is done in terms of the contract. 6. Records of compliance / non-compliance with the conditions of the authorisation must be kept and be available to GDARD on request. 7. Records of all environmental incidents must be maintained and a copy of these records be made available to GDARD on request throughout the project execution. 8. Confirm, with ECO suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. 9. All construction equipment must be stored within this construction camp.	**DEV / ECO / C**	

	10. All servicing must take place within this camp on a sealed surface such as a concrete slab or else off site if necessary. 11. Where possible unskilled labourers should be drawn from the local market 12. Training of site staff • Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. • Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. • Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. • No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager. • Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and • Receive the necessary safety training.		

5. Environmental Management Programme: Construction Phase

5.1. Site Clearing

Site clearing must take place in a phased manner, in accordance with the accepted construction programme, as and when required. Areas which are not to be constructed on within a reasonable period must not be cleared to reduce erosion risks. The area to be cleared must be clearly demarcated and this footprint strictly maintained. Spoil that is removed from the site must be removed to an approved spoil site or DWS licensed landfill site. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. These include wetland. Topsoil from the construction area must be neatly stockpiled ready for backfill when required.

5.2. Site Establishment

Site establishment shall take place in an orderly manner and all required amenities shall be installed at Camp site before the main workforce move onto site. The Construction camp shall have the necessary ablution facilities with chemical toilets. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.

The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a DWS registered landfill. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.

Table 3: Construction Traffic and Access

IMPACT	CONSTRUCTION TRAFFIC AND ACCESS This section deals with the impact that construction traffic and access has on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / ECO**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Construction traffic	1. Existing roads must be utilised as far as possible. 2. Construction routes and required access roads must be clearly defined and necessary permits, if required obtained prior to construction. 3. A site specific environmental sensitivity plan must be used to identify a low sensitivity area that is suitable for the establishment of construction camp. 4. The Contractor must ensure that the ECO inspects each site selected for the development of any infrastructure development such as access routes, construction campsites, etc. 5. The construction camp must be fenced and access controlled. 6. The Contractor must provide proposed layout of construction camps to the engineer prior to site establishment. 7. Delivery of equipment must be undertaken with the minimum amount of trips and clearly designated. 8. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 9. Planning of site delivery hours must be scheduled to avoid peak hour traffic, weekends and evenings. 10. Maintenance crew must be utilized to clean roads to reduce dust nuisance. 11. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 12. On-site maintenance e.g. oil changes and servicing of equipment will be allowed on site (except in sensitive areas as identified in BAR) provided that adequate preventative measures are implemented (use of drip trays and other spill prevention / response measures in particular). Dedicated locations for servicing/maintenance/oil changes should be prepared using impermeable	**C/ EO / ECO / DEV**	**Weekly**

	liner. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels. 13. Temporary access roads to be rehabilitated prior to the Contractor leaving the site.		
Access	14. Strategic positioning of entry and exit points to ensure as little effect as possible on the traffic. 15. The main routes to the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-Contractors. 16. Planning of access routes to the site for construction purposes shall be done in conjunction between the Contractor, the Developer (Local Authority) and the Landowner. All agreements reached should be documented and no verbal agreements should be made. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a “NO ENTRY for construction vehicles" sign 17. A construction method statement for the proposed wetland crossing must be approved by the DWS and appended to this EMPr. 18. Where new access roads are constructed, this must be done according to design and contract specifications. Drainage channels shall be suitably designed to ensure erosion does not occur, especially at the outflow points. The new access road shall be designed to allow for the natural flow of water where applicable. Crossings of dongas and Environmental Authorised areas on access routes to new site shall be thoroughly planned and installed according to design and contract specifications. All areas susceptible to erosion shall be protected with suitable erosion control measures from the onset of the project. Prevention is the ultimate aim, as restoration is normally very difficult and costly		
Road maintenance	19. Where necessary suitable measures shall be taken to rehabilitate damaged areas In the event of rehabilitation work being required on private roads, such work will be done to the original or better condition of the private road.	**C / ELO / ECO**	**Weekly**
	20. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water 21. Damages as soon as these develop. 22. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.		
General	23. The Contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place. 24. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.	**C**	**Weekly**

	25. Limited construction activities strictly to daylight hours. 26. No construction work to be conducted at night. 27. Construction work to be conducted: Monday-Friday between 7:00-17:00 and on Saturdays between 8:00-15:00. 28. No construction work to be undertaken on Sundays and Public Holidays.		

Table 4: Construction Camp

IMPACT	**CONSTRUCTION CAMP** This section deals with the impacts relating to the construction camp (equipment and batching camp)	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / EO / ECO**	**weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Site of construction camp	1. Choice of site for the Contractor's camp requires the construction manager and ECO's permission and must take into account location of local residents and / or ecologically sensitive areas, including flood zones and slip / unstable zones. A site plan must be submitted to the construction manager and the ECO for approval. 2. No construction personnel, other than security personnel, shall be allowed to stay overnight inside the construction camp unless authorised by the Site Manager. 3. The construction camp may not be situated within the 1:100 year flood line or on slopes greater than 1:3. 4. The size of the construction camp should be minimized (especially where natural vegetation or grassland has had to be cleared for its construction). 5. Adequate parking must be provided for site staff and visitors. This should not inconvenience or serve as a nuisance for neighbours. 6. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 7. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented. 8. No fires to be allowed for any purposes. 9. Heavy smoke may not be released into the air. 10. Fire extinguishers must be provided at the site camp, where it is easily accessible.	**C / ECO**	**Weekly/On-going**

	11. Fire extinguishers must be serviced, full an in good working condition. 12. The Contractor's Health and Safety Plan must include particulars in terms of firefighting and training. 13. Adequate on-site chemical sanitation systems, at least one toilet for every 8 (eight) workers, must be provided within walking distance to all construction workers. 14. Toilets must be located within the construction camp. 15. Toilets shall be serviced once a week to prevent spillages. 16. Under no circumstances may ablutions occur outside of the provided facilities. 17. No washing or bathing in any natural water bodies shall be allowed. 18. Toilets to be placed on flat surfaces to prevent erosion. 19. Under no circumstances must any vehicle be allowed to drive in the wetland area.		
Storage of materials (including hazardous materials)	20. Dedicated buffer zones will be identified and allocated where appropriate. Where a flood line is unknown, no development is permitted within 50m/100m of a watercourse Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. 21. Storage areas must be designated, demarcated and fenced if necessary. 22. Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by unauthorised persons i.e. children / animals etc. 23. Fire prevention facilities must be present at all storage facilities. 24. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the Engineer is charge. 25. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. 26. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 27. Storage areas containing hazardous substances / materials must be clearly signed.	**C / ECO**	**Weekly/On-going**

	28. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 29. An approved waste disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at DWS licensed landfill sites designed to handle hazardous wastes. A disposal certificate must be obtained from the waste disposal Contractor. 30. The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 31. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. 32. Any spillage, which may occur, shall be investigated and immediate action must be taken and reported to the ELO and ECO. In the event of significant spills (>35litres) of any hazardous substance, these must also be recorded and reported to the ECO, DWS and the local/provincial authorities where necessary. 33. The Contractor must be in possession of an emergency spill kit. Foreman and site managers must receive appropriate training in dealing with spills.		
Drainage of construction camp	34. Run-off from the camp site must NOT discharge into neighbours' properties or into adjacent wetlands, rivers or streams.	**C / ECO**	**Weekly/On-going**
End of construction	35. Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, seeding shall be done. Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and vegetated. 36. Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment. 37. Specific areas must be designated for cement batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated. 38. The construction camp must be kept clear of litter at all times. 39. Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal. 40. No open fires are allowed within the construction camp and no wood from surrounding vegetation may be used to create a fire.	**C / ECO**	**Weekly**

Table 5: Environmental Education and Training

IMPACT	ENVIRONMENTAL EDUCATION AND TRAINING This section deals with the environmental training of construction employees who will work on the R21 Bulk Water Supply Pipeline construction site	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**ECO / C**	**Monthly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Environmental training	1. Ensure that prior to the commencement of activities on site all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include; • What is meant by "Environment" • Why the environment needs to be protected and conserved • How construction activities can impact on the environment • What can be done to mitigate against such impacts • Awareness of emergency and spills response provisions • Social responsibility during construction e.g. being considerate to local residents 2. It is the Contractor's responsibility to provide the site foreman with no less than 1 hour's environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff. 3. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary. 4. Use should be made of environmental awareness posters on site. 5. The need for a "clean site" policy also needs to be explained to the workers. 6. Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. 7. The Contractor responsibilities include *inter alia:* • Display of Environmental Awareness Posters • Hard Copy of the EMPr • Complaints Register • Waste Disposal File • Training Records • Incident Reports	**ECO / C**	**Monthly**

	• Emergency Response Details		
Monitoring of environmental training	8. The Contractor must monitor the performance of construction workers to ensure that the points relayed during their environmental induction have been properly understood and are being followed. If necessary, the ELO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.	**EO / C / ECO**	**Monthly**

Table 6: Pipeline Construction

IMPACT	**PIPELINE CONSTRUCTION** This section deals with the impacts relating to the laying of pipelines. Note that all required design will be done according to the (…… of Mechanical Engineers) standards.	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / DEV / ENG**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General construction	1. Construction work to be conducted: Monday-Friday between 7:00-17:00 and on Saturdays between 8:00-15:00 in sensitive areas such as residential areas. Where construction is required to after hours in order to avoid traffic interruptions, notification is to be sent out to all potential affected land owners. 2. Notification must also be ensured when essential services such as water or electricity are to be affected by the construction process.	**C / ENG / DEV**	**Weekly**
Welding	3. All welding must undergo a rigorous series of quality control testing	**C / Approved Inspection Authority**	
Backfilling	4. Topsoil must be segregated from subsoil. The subsoil is replaced first and then the topsoil. 5. Installation of pipeline must be coordinated to occur simultaneously wherever possible. Trenches must be backfilled and compacted to appropriate compaction densities as soon as possible.	**C**	
Reinstatement	6. The impacted areas must be deep ripped to loosen the soil. 7. The area must then be rehabilitated according to the construction methodologies outlined in various tables of this EMPr. 8. Regular inspections to ensure compliance to these requirements. Inspections must occur on an ongoing basis, with audit reports being compiled and submitted to the GDARD. 9. The top 20cm of soil must be stripped as fertile top soil and stockpiled aside at specifically	**C**	

	designated areas to be used in the rehabilitation of the site in the final phase of construction. Suitable storage areas must be identified within disturbed area, in consultation with the ECO, prior to commencement of construction. 10. It is important that the footprint of disturbance by heavy machinery during construction be limited, in order to ensure quick recovery of the site.		
Construction near Houses	11. Affected neighbouring houses, that are adjacent or in close proximity to the pipeline construction areas e.g. within 100m of the construction site, will be consulted, 2 months prior to construction activities to commence, by the Developer and Contractor. The purpose of this engagement will be to discuss what their concerns are with respect to construction activities and how these can be addressed. Applicable legislation in terms of construction are captured in the construction regulations as part of the Occupational, Health and Safety Act (OSHAct), the National Building Regulations and, SANS 1200 Section A, Standardised Specification for Civil Engineering Construction. 12. Particular attention will be paid to clearly consulting with the, children, parents, bus drivers, Emergency Services, etc. and the public in general about the Construction methodology, timeframe, risks and dangers associated therewith and the steps to be taken by the Contractor to ensure a safe and accident free environment. 13. A separate Construction Method Statement (CMS will be prepared to ensure that all risks have been identified and safety measures are in place to assure a safe and accident free working environment. This is achieved by carrying out a detailed Job Risk Analysis followed by a detailed Job Safety Analysis. Mitigation actions will be described against each risk or safety issue that is identified. The Developer will, then, on the basis of the CMS, consult with the relevant neighbours to finalise the reasonable mitigation measures which should be implemented during construction. 14. Typically, the CMS will clearly describe all of the work activities and risk mitigation actions as well as a timeline schedule for carrying out and completing each one. The CMS will include a map and/or drawings/sketches showing the location of the neighbouring properties and all existing means of normal access to or egress therefrom including pathways, sidewalks, roads, fenced areas, gates, fire hydrants, emergency access and exit routes; parking areas, assembly points, etc. During the construction period temporary means for safe access as well as lighting and the formal temporary traffic management system that must be operational to ensure the safe control of all pedestrian and vehicular traffic in the vicinity. Drawings will also be prepared to clearly identify the location of all temporary barriers that will be installed to ensure that access to the working areas is tightly controlled. Guards will be on duty 24/7 to strictly prevent unauthorised persons including children from gaining access to the work and lay-down areas. Additional temporary	**DEV / ENG / C**	**2 Months prior to Construction**

	barriers and shields will be erected to isolate specific work areas from public view. The CMS will also include explanations concerning reinstatement on completion of the work and the controlled removal of temporary safety measures. 15. The Developer will nominate a single point of contact who can be contacted at any time for further discussion or clarification. 16. Adherence / Compliance to SANS10103 and Gauteng Noise Control Regulations.		

Table 7: Specialised Construction Methods

IMPACT	**SPECIALISED CONSTRUCTION METHODS** This section deals with the impacts relating to the unique construction methods that are utilised in construction of a bulk water supply pipeline	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / DEV /ENG**	**Bi weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Contractor to submit detailed procedures for review to ensure any environmental issues are mitigated. The method statement will clearly outline: a. Timing of the activity b. Materials to be used c. Equipment and staffing requirements d. Proposed construction procedure designed to comply with environmental specifications e. System to be implemented to comply with environmental specifications f. Other information deemed necessary by the ECO 2. Method Statements shall be submitted 14 days prior to implementation to allow for signed approval by the ECO. 3. All modifications to method statements must be submitted in writing to the resident engineer and the ECO for approval. 4. The method statements required but are not limited to the following: a. Location, layout and preparation of the construction camp site and materials storage areas;	**C**	

	b. Location, layout and preparation of the concrete batching/mixing facility as well as management of the runoff from the area c. Emergency plans for hazardous substance spills and the clean-up methods to be employed d. Implementation of Environmental awareness training and toolbox talks for all Contractor staff members and management team. e. Solid waste management		
Piling foundations	5. Contractor to supply method statement for the foundation piling 6. The method statements required but are not limited to the following: a. Vibration monitoring - levels are dependent upon the type of soil or rock. b. Noise monitoring - with respect to the most sensitive receptors i.e. residents on First Road. • Vibration –		

Table 8: Hydro Testing

IMPACT	**PIPELINE TESTING** This section deals with the impacts relating to the tests which are conducted once the R21 bulk water supply pipeline	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / ENG / DEV**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Hydrostatic testing	1. Water saving practices should be undertaken during hydrostatic testing and water wastage must be avoided. 2. Water utilised for hydrostatic testing must be disposed of accordingly at a DWS approved site. No uncontrolled discharges to the environment are permitted. 3. Care must be taken not to contaminate the surrounding soil while undertaking testing. 4. Hydrostatic testing procedures must be finalised in consultation with the Department of Water and Sanitation	**C / ENG / DEV**	
Non-destructive testing (NDT)	5. Materials used for NDT must be safely stored and soil contamination avoided.	**C / ENG / DEV**	

Table 9: Soils and Geology

IMPACT	SOILS AND GEOLOGY This section deals with the impact that the proposed development will have on soils and geology	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**ECO / C**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Topsoil	1. The Contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Should any topsoil become polluted the Contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with approved topsoil which should be at least equal to Department of Agriculture approved topsoil specifications. 4. Removed polluted topsoil should be transported to a licensed landfill site. 5. Topsoil piles to be protected against sheet and wind erosion.	**ECO / C**	**Weekly**
Soil Stripping	6. No soil stripping must take place on areas within the site that the Contractor does not require for construction works or areas of retained vegetation. 7. The top 20cm of soil must be stripped as fertile topsoil and stockpiled aside at specifically designated areas to be used in the rehabilitation and landscaping of the site in the final phase of construction. 8. Subsoil and overburden in all construction and lay down areas should be stockpiled separately to be returned for backfilling in the correct soil horizon order. 9. Construction vehicles must only be allowed to utilise existing tracts or pre-planned access routes to minimise the footprint of disturbance.	**ECO / C**	**Weekly**
Stockpiles	10. Stockpiles should not be situated such that they obstruct natural water pathways. 11. Stockpiles should not exceed 2m in height unless otherwise permitted by the	**ECO / C**	**Weekly**

	Engineer. 12. Stockpiles are to be protected by installing adequate protection barriers to minimize loss of soil where practicable as due to windy conditions or heavy rain, depending on the duration of the project. Dust mitigation and erosion protection measures will be implemented. 13. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. 14. Stockpiles must not be contaminated with oil, diesel, petrol, garbage or any other material, which inhibit the later growth of vegetation on the soil. 15. The temporary storage of topsoil, inert spoil, fill etc. must be away from all storm water systems. 16. Areas to be rehabilitated as soon as possible after disturbance to satisfaction of the ECO. 17. During construction when soil exposure cannot be avoided, temporary soil erosion control measures (erosion blanket, etc.) should be introduced as per specification by the project engineer and ECO. 18. Construction schedules to indicate which areas can be cleared for construction work. 19. Access to the site must be clearly demarcated and to be used at low speeds to avoid excessive dust, noise and soil erosion. 20. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof of from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur should be forwarded to the GDARD.		
Fuel storage	21. Topsoil and subsoil to be protected from contamination. 22. Fuel and material storage must be away from stockpiles. 23. Provisions should be made to contain spillages or overflows into the soil. 24. Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 25. Appropriate measures should be taken to prevent any pollution that might impact the environment especially on water resources. 26. Contaminated soil must be contained and disposed of off-site at an approved landfill site. Records of disposal to be forwarded to GDARD.	**ECO / C**	**Weekly**

Concrete mixing	27. The concrete batching plant must be contained within a bunded area. 28. Concrete mixing must only take place within designated areas and must take place on impervious surface such as a concrete slab, metal or plastic sheeting which is provided with cut-off drains or berms to contain any contaminated run-off. 29. All concrete that is spilled outside these areas must be promptly removed by the Contractor and taken to an approved dumpsite. 30. Ready mixed concrete must be utilised where possible. 31. No vehicles transporting concrete to the site may be washed on site. 32. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated run-off from the batch plant must not be allowed to get into the storm water system or any rivers, streams, wetlands or existing erosion channels / dongas. 33. No concrete residue is to be washed off into rivers, streams or wetlands.	**ECO / C**	**Weekly / Monthly**
Earthworks	34. All earthworks must be adequately controlled and managed. 35. Where necessary, the construction site should be dampened on a regular basis to suppress dust emissions. 36. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas. According to specifications by the developer's landscape architect the area should be re-vegetated upon completion of construction activities. 37. Installation of the pipeline must be coordinated to occur simultaneously wherever possible. Trenches must be backfilled and compacted to appropriate compaction densities as soon as possible. 38. It is very important that the foundation excavations for the proposed structures be inspected by an engineering geologist or geotechnical engineer prior to the placing of steel reinforcement or concrete in order to determine that the structure is being founded upon the correct material, and also to detect whether any active layers have been exposed by the foundation excavation. 39. Earthworks and changes to the natural form of the ground should be kept to a minimum. 40. Where the embankments higher than 1,200mm are created, these should be contoured to approximate the natural form of the landscape. 41. The use of machinery in ecologically sensitive areas is to be limited as far as	**ECO / C**	**Weekly**

	possible.		
Herbicides / pesticides	42. Herbicides should not be used excessively and slow release fertilizers and organic products should be used in preference to highly soluble and inorganic fertilizers. 43. The use of herbicides and pesticides and other horticultural chemicals should be carefully controlled wherever these are used. Where feasible, 'environmentally friendly' products should be utilised.	**ECO / C**	**Weekly**
Geology of the site	44. Sufficient mitigation measures e.g. blast mats must be put in place during blasting to minimise fly rock. 45. The surrounding landowners must be notified of any planned blasting, and necessary precautionary measures implemented prior to blasting. 46. Rupture surveys in local area to check and record existing structural ruptures so as to exclude risk of insurance claims to Contractor / client from other parties. 47. Clear safe zone around blast point to prevent potential injury to personnel and damage to equipment on site, this should be done in accordance to the applicable Health and Safety Regulations. This may include in certain situations halting traffic temporarily.	**ECO / C**	**Once off/ Weekly**
SITE SPECIFIC MITIGATION MEASURES			
Blasting	48. Ensure that adjacent works limit blast charges. Alternatively, depending on technical requirements for R21 Pipeline site, an exclusion zone of no blasting may be necessary. 49. Ensure legal requirements are in place with party constructing adjacent to existing services/pipelines to protect the developer. 50. The surrounding landowners must be notified of any planned blasting, and necessary precautionary measures implemented prior to blasting.	**ECO / C**	**Once off/ Weekly**
Expansive Clay	51. Pollution potential assessed by detailed geo-hydrological study with appropriate mitigation measures. 52. Monitoring of installation via the long term to continually check for leaks. 53. Should leaks occur then the installation should be appropriately repaired and / or remedial measures implemented to prevent repeat of problem. 54. An emergency response plan for potential damage to the pipeline or severe leakage should be implemented. 55. In areas where expansive clays are present it is recommended that the expansive	**ENG / DEV**	

	clay be removed where it is shallow and replaced with an inert soil.		

Table 10: Erosion Control

IMPACT	EROSION CONTROL This section deals with the impact that the proposed development will have with regards to potential erosion	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**ECO / C**	**Bi Monthly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Wind screening and storm water control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: • Brush packing with cleared vegetation • Mulch or chip packing • Planting of vegetation • Hydro seeding / hand sowing. 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. Siltation traps should be introduced to capture eroded material during heavy rainfall. 6. During heavy rainfall periods, storm water control measures must be implemented to reduce flow velocity and ensure that large volumes of water are not channelled onto unprotected soil surfaces. 7. All erosion control mechanisms need to be regularly maintained. 8. Existing roads must be utilised as far as possible. 9. Retention of vegetation where possible to avoid soil erosion 10. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.	**ECO / C**	**Bi Monthly**

	11. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. 12. No impediment to the natural water flow other than approved erosion control works and DWS approved wetland management is permitted. 13. To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the Project Manager for approval and must include the location and design criteria of any temporary installations. 14. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion, only if natural seeding does not occur.		

Table 11: Ground and Surface Water Pollution

IMPACT	**GROUNDWATER AND SURFACE WATER POLLUTION** This section deals with the impact that the construction and operation of the development could have on ground and surface water pollution	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**ECO / C**	**On-going or Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Sanitation	1. Adequate on-site chemical sanitation systems, at least one toile for every 8 (eight) workers, must be provided within walking distance to all construction workers. 2. Toilets muse be located within the construction camp on a gentle gradient. 3. Toilets shall be serviced once a week to prevent spillages. 4. Under no circumstances may ablutions occur outside of the provided facilities. 5. No washing or bathing in any natural water bodies shall be allowed.	**ELO / C**	**On-going/Weekly**
Hazardous materials	6. Use and/or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled. 7. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential storm water events.	**ECO / C**	**Weekly**

	8. Any hazardous substances must be stored at least 50m from any of the water bodies on site. 9. The ECO should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. 10. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.		
Concrete / Cement mixing	11. Concrete /Cement contaminated water must be detained, settled and pH tested before allowed to enter the water system as this disturbs the natural acidity of the soil and affects plant growth. Only neutral (pH 6-8) may be allowed to enter water systems.	**ECO / C**	**Weekly**
Public areas	12. Food preparation areas should be provided with adequate washing facilities, clean drinking water and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 13. The Contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 14. No washing of vehicles except at designated sites. 15. Information and warning signs to be erected in and around the development areas alerting the public on construction in progress.	**ECO / C**	**On-going/Weekly**
Water resources	16. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing. 17. Appropriate measures should be taken to prevent any pollution that might impact on the environment especially on water resources. 18. Municipal water (or another source accepted by the ECO and Project manager) should instead be used for all activities such as washing of equipment, dust suppression, concrete mixing, compacting, or for any construction or related activities. 19. The DWS and the ECO as well as other Emergency contact numbers provided by the Municipality should be contacted in order to deal with spillages and	**ECO / C**	**Weekly**

	contamination of aquatic environments.		
SITE SPECIFIC MITIGATION MEASURES			
General	***Refer to Table 17 for detailed wetland measures.*** 20. Ensure that surface/storm water is diverted away from excavation trenches 21. Ensure that stream flow can bypass construction site 22. Ensure that contaminants are safely stored and away from construction site.	**ECO / C**	**Weekly**
Hydro-testing	23. The source of water for hydro testing must be agreed with the DWS prior to use. 24. Any water discharge will have to comply with the water quality standards as agreed with DWS. 25. Discharge permits will need to be obtained from DWS prior to any discharge to the natural environment.	**C**	

Table 12: Hydrology and Storm Water

IMPACT	**HYDROLOGY AND STORMWATER** This section deals with the impact that the construction and operation of the development could have on hydrology and storm water	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**ECO/ EO / C**	**weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. 2. Silt fences should be used to prevent any soil entering the storm water drains. 3. Temporary cut-off drains and berms may be required to capture storm water and promote infiltration. 4. Promote water saving mind set with construction workers in order to ensure less water wastage. 5. New storm water construction must be developed strictly according to specifications from engineers in order to ensure efficiency. 6. Hazardous substances must be stored at least 20m from any water bodies on site	**ECO/ EO / C**	**Weekly**

	to avoid pollution. 7. The installation of the storm water system must take place as soon as possible to attenuate storm water from the construction phase as well as the operation phase. 8. Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water path ways over the site. i.e. these materials must not be placed in storm water channels, drainage lines or rivers. 9. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 10. Water erosion could be managed through the following measures: • Construction time should be scheduled outside of the rainy season; • Use of erosion blankets or geotextiles where vegetation have been removed; and • Reducing the speed of run-off on roads by using speed bumps and not channelling or concentrating stormwater. 11. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.		

Table 13: Air Quality

IMPACT	**AIR POLLUTION** This section deals with the impact from air pollution	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**EO / C**	**Daily**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
MITIGATION / METHOD STATEMENT			
Dust control	1. To prevent dust nuisance a maintenance crew will be utilised to clean roads. 2. Retention of vegetation where possible will reduce dust travel 3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into	**EO / C**	**Daily**

	neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. Blasting must be carried out in accordance with legislation using optimal and not excessive quantities of explosives. Blasting should where practical be restricted to calm days in order to reduce dust carry. The geotechnical report indicated that the probability of blasting is low. 6. The Contractor shall be responsible for dust control on site to manage potential nuisance caused to the Landowner or neighbouring Communities. 7. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.		
	8. Rehabilitation The Contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks. ELO / Contractor after completion of Earthworks.		
Odour control	9. All construction vehicles must comply with relevant vehicle emissions standards 10. Regular servicing of on-site toilets to avoid potential odours. 11. Allocated cooking areas must be provided as heavy smoke may not be released into the air. 12. The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LP gas cookers may be used provided that all safety regulations are followed.	**EO / C**	**Weekly**
Fire prevention	13. The Contractor must ensure to comply with NEM: Air Quality Act (Act No. 3 of 2004) 14. The Contractor must ensure that any grass left in a natural state within 10m of the construction servitude during construction should be cut in order to prevent veld fires, especially during the dry months. 15. No open fires shall be allowed on site under any circumstance (The Forest Act, No 122 of 1984). All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. 16. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire fighting equipment must be assessed and evaluated through a typical risk assessment process. It may be required to be increase the level of protection during the winter months.	**EO / C**	**Weekly**

Table 14: Noise

IMPACT	NOISE This section deals with the impact that increased noise will have on surrounding areas	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / EO**	**Daily**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of residential areas in close proximity to the development. 2. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located where possible away from noise sensitive areas. Once the proposed final layouts are made available by the Contractor(s), the sites must be evaluated by the Contractor and specific measures designed in to the system as far as practical. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits. All noise and sounds generated must adhere to SANS 10103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies. 5. Noisy operations should be combined so that they occur where possible at the same time. 6. Blasting operations (if required) are to be strictly controlled as per all safety regulations. Due notification to the public must be made, which provide information on the time, place and date of the blast. 7. Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed. 8. With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Contractor should liaise with local residents on how	**C / EO**	**Daily**

	best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities. 9. As construction workers operate in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary ear protection gear should be worn. 10. Noisy activities to take place during allocated construction hours only as per section 25 of the Noise Control Regulations of the Environment Conservation Act, 1989 (Act No. 73 of 1989) 11. Noise from labourers must be controlled. 12. The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his Sub-Contractors by the Contractors own transport.		

IMPACT	**MONITORING** This section deals with monitoring of impacts of noise and dust during construction	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / EO**	
ENVIRONMENTAL MANAGEMENT PROGRAMME			
Noise monitoring	1. The Contractor shall prepare a noise monitoring procedure. 2. Noise monitoring shall be carried out using integrated sound level meters the calibration certificate of which shall be attached to this document once the unit is available. 3. Noise monitoring shall respect the following requirements: a. Monitoring is to take place at points of impact where there is expected to be disturbance to the public or landowners form construction activities and at worksite boundaries if applicable; b. Monitoring points are to be agreed with the ECO's on site and are to be recorded and referenced properly. c. Monitoring is to take place at points of impact where there is expected to be disturbance to the public or landowners form construction activities and at worksite boundaries if applicable; d. Monitoring points are to be agreed with the ECO's on site and are to be recorded and referenced properly.	**C / EO**	This data will be submitted to EMM on a monthly basis
	4. Noise baselines:	**C / EO**	Baseline noise monitoring

	Baseline noise monitoring shall be conducted so that the real Impact caused by construction activities could be effectively measured;		should take place for at least 2 weeks but preferably 1 month prior to construction activities in an area and should continue for at least 2 weeks but preferably one month after the major construction activities have ended.
	5. Monitoring the construction activities: a. During construction activities noise levels are to be monitored at all points as agreed with the ECO. The monitoring points are to remain constant and are to be monitored during a variety of times during working hours. b. These periods are to be times during which construction activities are taking place and should not fall over lunch breaks, on public holidays or other periods of reduced activities. c. Data recorded is to reflect the ambient average noise level for the monitoring period. d. The data is to reflect the ambient average noise level for the monitoring period. e. The data is to be recorded onto field data sheets and is to be captured on a central database. f. The reporting of all noise monitoring data is to be done via the relevant reporting channels to EMM	**C / EO**	At least once per week.
	6. Calibration certificates are to be provided for all new equipment and regular field calibration is to be done as per the manufacturer's specifications. These calibrations are also to be recorded on a register.	**C / EO**	
	7. The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication shall be as per SANS 10103:2004. The Contractor is to monitor noise in relation to the type of area in which activities are taking place.	**C / EO**	
Dust monitoring	8. The Contractor is required to implement a dust management programme, the aim of which is to ensure that the air quality on site does not impact negatively on the health or environment of the persons, animals and plants that are living and working in close proximity to the construction activities. The primary purpose of the dust management programme is to be able to measure the efficiency of the		

<table>
<tr><td></td><td>dust management programme. As dust is an immediate problem which results in loss of visibility “at the present moment” so visual monitoring of dust conditions is considered to be the most effective means of monitoring this.</td><td></td><td></td></tr>
<tr><td></td><td>9. Should there be areas where the management of dust suppression is not effective it is recommended that a quantifiable system is implemented.
a. The Contractor shall agree with the ECO’s the areas of greatest importance in terms of managing dust on site.
b. A number of meters for measurement of dust are to be placed thought the works areas during the work activities.
c. As far as possible dust monitoring stations will be active for at least 1 month prior to the onset of construction in the dry season in areas as directed by the ECO’s.
d. The meters will be placed in representative areas in such a way that they will not be impacted on by construction activities.
e. The location of the meters is to be agreed based on the closest points of impact such as schools, houses, dangerous bends on roads and at businesses.
f. The meters will collect fall out dust either in a single bucket unit or in a directional dust collection device with four removable dust collection cups.
g. The agreement of the preferred collection device for each area is to be agreed on site with the ECO’s. The determination of this will be based on the potential dust sources.
h. In areas where dust is from sources other than construction are expected the directional meters are recommended.
i. All meters are to be at a height of 2m above the ground and are to be firmly planted or weighed down to prevent wind damage.
10. Where readings are unacceptably high the areas will be classified as a hot spot and weekly monitoring may be advised until such time as the dust problem has been rectified.</td><td></td><td>Monthly collection of the samples is to be done.</td></tr>
<tr><td></td><td>11. The classification of dust levels is indicated in the table below and is based on the Department of Environmental Affairs and Department of Minerals and Energy definition of dust levels
<table><tr><th>Dust level</th><th>Quality)g/m²/day)</th><th>Action required</th></tr><tr><td>Slight</td><td>> 250</td><td>No additional action</td></tr><tr><td>Moderate</td><td>250 to 500</td><td>Investigate cause of increase and upgrade dust management efforts with water carts</td></tr><tr><td>Heavy</td><td>500 to 800</td><td>Increase dust management efforts with water</td></tr></table></td><td></td><td></td></tr>
</table>

			carts or binding agents		
	Very heavy	800 to 1200	Use of additional agents for dust management		
	Areas considered to be “active areas” where dust can be expected include: a. All areas were trenching, drilling, blasting and backfilling are taking place. b. Where the above activities are taking place including areas were hauling is actively being undertaken. c. Note that rehabilitation areas are not considered to require monitoring. d. It is also noted that other material will from time to time skew results. This other material includes ash from veld fires, sand, grass and other seeds. These will not be totally eliminated by the design of the meters and the interpretation of the results are to take these factors into account				

Table 15: Flora

IMPACT	**FLORA** This section deals with the impact that the development will have on flora on site and in the surrounding areas	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**ECO / C**	**weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Existing vegetation	1. Existing indigenous vegetation must be retained where possible. 2. A follow up vegetation survey should be conducted before site clearing to demarcate vegetation that should remain and remove and relocate any plants of botanical or ecological significance. 3. Vegetation to be removed as it becomes necessary. 4. All possible alien plant species present on site and surrounding properties should be at least eliminated and at best replaced with species indigenous to the area. 5. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 6. No existing vegetation to be used for firewood on site.	**EO / C**	**Weekly**
Rehabilitation	7. All damaged areas shall be rehabilitated upon completion of the contract in	**ECO / C**	**Weekly**

	accordance with design specifications. In accordance with the Conservation of Agricultural Resources Act, Act No 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. Extra seed shall be sown on disturbed areas as directed by the ECO (see below for specifications). Other methods of rehabilitating disturbed sites may also be used at the discretion of the Contractor; and approved by ECO to comply with the conditions of the Environmental Authorisation and EMPR, e.g. stone pitching, logging, etc. Contour banks shall be spaced according to the slopes. The type of soil shall also be taken into consideration. 8. A mixture of vegetation seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial species are chosen. b) Pioneer species are included. c) Species chosen will grow in the area under natural conditions. d) Root systems must have a binding effect on the soil. e) The final product should not cause an ecological imbalance in the area. 9. To get the best results in a specific area, it is a good idea to consult with a vegetation specialist or the local Extension Officer of the Dept. of Agriculture. Seed distributors can also give valuable advice as to the mixtures and amount of seed necessary to seed a certain area. 10. All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit. 11. Rehabilitation must take place as soon as construction is complete to avoid the infiltration of alien species and soil erosion within the site. 12. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 13. Rehabilitation process should be monitored and maintained throughout the construction phase and post construction phase until rehabilitation has been successfully completed 14. Appropriate indigenous vegetation must be planted on the site to -attract avi-fauna, reptiles and small mammals back into the area		
Permits	15. Permits for removal of any protected species must be obtained from Provincial Nature Conservation should such species be affected.	**EO / C**	**Weekly**
Demarcation of construction site	16. All natural vegetation not interfering with the site construction shall be left	**EO / C / ECO**	**Weekly**

	undisturbed, clearly marked and indicated on the site plan. 17. The construction area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint. 18. Areas which are identified by the ECO as being ecologically sensitive and which are adjacent to any construction work are to be suitably demarcated to prevent damage by labour and equipment. 19. Vegetation removal must be phased in order to reduce impact of construction. 20. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 21. Where the route passes intact vegetation (but does not impact on it), a buffer zone should be established to ensure that construction activities do not extend into these areas. 22. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 23. Daily environmental auditing must take place.		
Utilisation of resources	24. All construction staff are prohibited from gathering of firewood, fruit, muthi plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.	**/ C / ECO**	**Weekly**
Exotic vegetation	25. All exotic vegetation must be removed from site. 26. Alien vegetation on the site will need to be controlled in terms of Government Notice R1048. 27. The Contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 28. The spread of exotic species occurring throughout the site should be controlled.	**EO / C**	**weekly**
Herbicides	29. Herbicide use shall only be allowed with the approval of the Developer and according to relevant contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used. 30. The use of pesticides and herbicides within the servitude must be discouraged as this will impact on important pollinator species of indigenous vegetation.	**EO / C / DEV**	**Weekly**
Construction schedule	31. Where possible, construction should take place during winter i.e. the dormant	**C / DEV**	

	stage to minimise impacts on vegetation during the growing season.		
SITE SPECIFIC MITIGATION			
Sensitive area mitigation measures	32. Sensitive wetland area. 33. Environmental audits (daily/weekly/on-going in these sensitive areas) by an independent party during this construction period. 34. A copy of the Basic Assessment Report and associated Environmental Management Programme must be present at the construction site for easy reference to specialist recommendations in sensitive areas. 35. It is recommended that the construction crew be educated about the sensitivities involved in this area as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference.	**EO / C / ECO / Ecologist**	**Daily/Weekly/On-going**

Table 16: Fauna

IMPACT	**FAUNA** This section deals with the impact that the development will have on fauna in the area	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**ECO**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Containment of construction site through identified sensitive areas 2. Demarcation of sensitive areas prior to construction activities starting 3. Intensive environmental auditing in these areas (daily/weekly/on-going audits recommended) 4. No trapping or damage to fauna on the construction site should be allowed.	**ECO / C**	**Daily**
SITE SPECIFIC MITIGATION			
General	5. All activities on site must comply with the regulations of the Animal Protection Act, (Act No. 71 of 1962). 6. The containment of the proposed site to the existing impacts identified will be an important mitigation measure which must be combined with a containment of all	**ECO / C/**	**Daily**

	construction related activities to the minimum area. 7. No faunal species occurring on site or on adjacent properties may be captured or intentionally harmed. The setting of snares will be strictly prohibited and EMM shall take stringent actions against any individual found to be guilty of such offence. 8. The Contractor shall advise his/her workers of the penalties associated with the needless destruction of wildlife, as set out in the Animal Protection Act (Act No. 71 of 1962).		

Table 17: Wetlands and other surface features

IMPACT	**WETLANDS** This section deals with the impact that the development will have on wetlands and other surface water features in the study area	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**ECO / C / EO / Engineer / Wetland Specialist**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
MITIGATION / METHOD STATEMENT			
General	1. As specified in the GDARD guidelines for undertaking biodiversity assessments, prior to the onset of construction, the edge / boundary of each wetland must be clearly demarcated in the field with poles, sticks, or any solid structure that will last for the duration of the development. These indicators must be coloured as follows: i) red – Indicating the edge / boundary of the wetland ii) orange **–** Indicating the edge of the buffer zone 2. As specified in the GDARD guidelines for undertaking biodiversity assessments, a 32m / 50m buffer area (according to whether the wetland is located within or out of the urban edge) must be maintained around each wetland. Within this buffer zone a setback buffer area must be preserved. In this setback area, ground, vegetation and root systems must remain. 3. Measures should be implemented to prevent the transport of excess silt	**ECO / C / EO / ENG / Wetland Specialist**	**Daily**

	downstream. This should include the erection of silt barriers within the wetland immediately downstream of the construction site. 4. Where possible, the construction earthworks activities should occur during dry (winter months) when water levels and seepage in wetlands / rivers are lower. 5. Where dewatering of trenches is required, the water from the dewatering operation should be cleaned of any excess silt and be discharged back into a downstream portion of the wetland in a manner that does not cause the initiation of soil erosion. 6. No stockpile areas should be located within the wetland boundary, or within the associated buffer zone. 7. No hazardous materials (such as oil) should be kept within 50m of the edge of a wetland buffer zone. 8. No vehicles and access of persons should be allowed through the wetland.		
Erosion Control	9. Where possible, silt fences / barriers or other relevant measures should be installed along the edge of streams and wetlands to prevent soil erosion and ingress of runoff water carrying silt from the catchment of the wetland (i.e. the slopes surrounding the wetland) to enter the water body.	**ECO / Main C / EO / Engineer / Wetland Specialist**	**Daily**
SITE SPECIFIC MITIGATION			
Prevention of water pollution	44. The placing of silt fences / silt barriers adjacent to the wetland to prevent discharge of silt into the wetland, and the inclusion of buffer zones in which no stockpiles, machinery, chemicals or construction camps must be included to prevent pollution into the wetland. 45. Wetlands must not be viewed in isolation from the surrounding slopes / catchment, as eroded material or other potential pollutants emanating from the surrounding non-wetland areas adjacent to the wetland boundaries may enter the wetland and cause significant pollution of the wetland. 46. In cases where this seepage water is removed from the construction excavations, as part of a dewatering process, this water may contain a high silt load, which could have a detrimental effect if discharged back into the wetland. It is thus recommended that water from dewatering operations be cleaned of silt prior to the water being discharged into the wetland.	**ECO / C / EO / Engineer / Wetland Specialist**	**Daily**
Wetland sensitivity	47. The onsite wetland as per the DBAR is classified as Category C (Moderately	**ECO / Main C / EO /**	**Daily**

	modified). 48. Construction workers must be provided with a description of the flora and fauna of concern within the wetland area. 49. Design and planning should incorporate the natural features of the site, taking into consideration possible environmental risks, e.g. erosion at slopes. 50. Any areas disturbed by the construction of the pipeline should be rehabilitated.	**Engineer / Wetland Specialist**	

Table 18: Employment

IMPACT	**EMPRLOYMENT** This section deals with the impact that increased employment from the development will have on the area	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / ECO**	**Weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. The use of labour intensive construction measures should be used where appropriate. 2. Training of labour to benefit individuals beyond completion of the project 3. Labour to be sourced from the local community where possible 4. Local suppliers to be used where possible 5. The Project Manager must ensure that all staff working on the proposed project must be in possession of a South African Identity Document or a relevant work permit.	**DEV / C**	

Table 19: Waste Management

IMPACT	**WASTE MANAGEMENT** This section deals with the impact from waste Environmental Authorisation used by the development	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / EO / ECO**	**Weekly**

ENVIRONMENTAL MANAGEMENT PROGRAMME			
MITIGATION / METHOD STATEMENT			
Construction rubble	1. All rubble from demolition activities must either be used on site as part of the existing development, or must be taken off the reserve and disposed of at an approved site. 2. Rubble must not be dumped on site but must be placed within a skip bin for regular removal. 3. The Contractor is to ensure that waste disposal certificates are kept on file for record purposes should the GDARD request proof. 4. Construction rubble shall be disposed of in pre – agreed, demarcated spoil dumps that have been approved by the relevant EMM. ***5.*** Construction waste/rubble may not be burned or buried on site.	**C / EO / ECO**	**Weekly**
Litter management / Housekeeping	6. The Contractor shall maintain an effective waste management regime that ensures that there is adequate provision for waste disposal (in the form of bins), segregation and frequent removal (at least weekly) for permanent disposal at a licensed waste disposal facility. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 7. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 8. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent Contractor can be appointed to conduct this recycling. 9. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. 10. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly form the site by the local council. 11. All waste must be removed from the site and transported to a landfill site as approved by the relevant Municipality. No permanent waste disposal shall be permitted at the campsites 12. Waybills providing disposal at each site shall be provided to the Engineer's and ECO inspection.	**C / EO / ECO**	**Weekly**

Hazardous waste	13. All waste hazardous materials must be carefully stored as advised by the ECO, and then disposed of offsite at a licensed landfill site. 14. Contaminants to be stored safely to avoid spillage 15. Material Safety Data Sheets (MSDS) Information and records of all materials stored must be available and strict control of the volumes stored and removed must be kept. 16. Machinery must be properly maintained to keep oil leaks in check 17. Staff must be trained in the hazards and required precautionary measures for dealing with these substances.	**C**	**Weekly**
Sanitation	18. The Contractor shall install mobile chemical toilets on the site. 19. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed. 20. Ablution facilities shall be within 100m from workplaces but not closer than 50m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce (minimum requirement 1: 15 workers). Male and females must be accommodated separately where possible. 21. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly. 22. Toilets should be no closer than 100m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer. 23. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility. 24. The construction of “Long Drop” toilets is forbidden. 25. Potable water must be provided for all construction staff.	**C**	**Weekly**
Remedial actions	26. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 27. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 28. The Environmental Managers must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 29. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.	**C**	**Weekly**

	30. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 31. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 32. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal		

Table 20: Health and Safety

IMPACT	**HEALTH AND SAFETY** This section deals with the safety of workers and the public exposed to construction hazards	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / ECO / DEV**	**Daily**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
Worker safety	1. Implementation of safety measures, work procedures and first aid must be implemented on site. 2. A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety. 3. Workers should be thoroughly trained in using potentially dangerous equipment 4. Contractors must ensure that all equipment is maintained in a safe operating condition. 5. A safety officer must be appointed. 6. A record of health and safety incidents must be kept on site. 7. Any health and safety incidents must be reported to the project manager immediately. 8. First aid facilities must be available on site at all times. 9. Workers have the right to refuse work in unsafe conditions. 10. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc. especially under livestock. 11. A record shall be kept of drugs administered or precautions taken and the time	**C / Safety Officer**	**Daily**

	and dates when this was done. This can then be used as evidence in court should any claims be instituted against EMM or the Contractor. 12. The Contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers. 13. Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.		
Worker facilities	14. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness 15. Fires are not to be allowed.	**C / Safety Officer**	**Daily**
Protective gear	16. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc. 17. No person is to enter the site without the necessary PPE. 18. SABS Standards and specifications governing dangerous processes such as welding and radiographic testing of welds must be strictly applied, with a view to proper protection of the public and workers.	**C / Safety Officer**	**Daily**
Site safety	19. The construction camp must remain fenced for the entire construction period. 20. Potentially hazardous areas such as trenches are to be demarcated and clearly marked 21. Adequate warning signs of hazardous working areas. 22. Uncovered manholes and excavations must be clearly demarcated 23. Emergency numbers for local police and fire department etc. must be placed in a prominent area. 24. Fire fighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank. 25. Suitable conspicuous warning signs in English must be placed at all entrances to the site. Emergency and Info signs must be in English and other applicable languages. 26. All speed limits must be adhered to.	**C / Safety Officer**	**Daily**
Construction equipment safety	27. All equipment used for construction, including drills, TLB's must be in good working order with up to date maintenance records.	**C / Safety Officer**	**Daily**

Hazardous Material Storage	28. Staff that will be handling hazardous materials must be trained to do so. 29. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. 30. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 31. Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site. 32. The bund walls for the transformer oil containers must be in place before the installation of these containers. 33. The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practise must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.	**C / Safety Officer / EO**	**Daily**
Procedure in the event of a petrochemical spill	34. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO. 35. The problem must be assessed and the necessary actions required will be undertaken. 36. The immediate response must be to contain the spill. 37. The source of the spill must be identified, controlled, treated or removed wherever possible.	**C / EO / ECO**	
Fire management	38. Fire fighting equipment should be present on site at all times as per OHSA. 39. All construction staff must be trained in fire hazard control and fire fighting techniques. 40. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. 41. No open fires will be allowed on site. 42. Smoking may only be conducted in demarcated areas.	**C / Safety Officer**	**Daily**
Safety of surrounding residents	43. All I & AP's should be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are: - Blasting - Earthworks / earthmoving machinery on steep slopes above houses / infrastructure	**C / Safety Officer / EO**	**Weekly**

	- Risk to residence along haulage roads / access routes		

Table 21: Security

IMPACT	SECURITY This section deals with issues of security during construction for workers and surrounding land users.	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / EO**	**weekly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Access to the construction site should be strictly controlled by a security company. 2. 24 hour security on-site. 3. Labour should be transported to and from the site to discourage loitering in adjacent areas and possible increase in crime or disturbance. 4. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them. 5. Other than pre-approved security staff, no workers shall be permitted to live on the construction site. 6. The site shall be fenced, where necessary to prevent any loss or injury to persons or livestock during the construction phase. 7. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing. 8. No alcohol / drugs to be present on site. 9. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel). 10. No harvesting of firewood from the site or from the residential and business properties adjacent to it.	**C / EO**	**weekly**

	11. Construction staff is to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden). 12. Trespassing on private / commercial properties adjoining the site is forbidden. 13. Driving under the influence of alcohol is prohibited. 14. All employees must undergo the necessary safety training and wear the necessary protective clothing. 15. Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.		

Table 22: Social Environment

IMPACT	**SOCIAL ENVIRONMENT** This section deals with the social impacts that the new development will have on the site and surrounds	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**DEV / C / ECO**	**Bi monthly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
MITIGATION / METHOD STATEMENT			
General	1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times. 2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This should be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings. 3. During the setup phase of the project the Contractor needs to make contact with those people that are interested in or affected by the development (I&AP's). The Contractor will notify adjacent neighbours and inform them of the intended development. He will also inform neighbours that a complaints register will be available on site. 4. No interruptions other than those negotiated shall be allowed to any essential services. Damage to infrastructure shall not be tolerated and any damage shall	**DEV / C**	**Bi monthly**

	be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site. 5. All existing private access roads used for construction purposes, shall be maintained at all times to ensure that the local people have free access to and from their properties. Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect. 6. Any possible disruptions to essential services must be kept to a minimum and should be well advertised and communicated to the Landowners and surrounding Communities. Care must be taken not to damage irrigation equipment, lines, channels and crops, as this could lead to major claims being instituted against EMM and the Contractor. The position of all pipelines and irrigation lines in the vicinity of a site must be obtained from the Landowners or local Community and clearly marked. Where required such lines shall be deviated.		
SITE SPECIFIC MITIGATION			
Built-up areas (residential)	7. Construction activities close to residential homes should be restricted to working hours to cause minimal disruption to local movement patters, i.e. between the hours of 8am and 5pm. 8. Inform landowners of the construction process so that they are prepared for the construction activities to follow. 9. Consult with landowners in the event that extreme construction activities, such as blasting, would have to take place. Agree on a certain date and time with the property owners for such activities to take place. 10. Damage caused to housing structures as a result of blasting should be repaired as soon as possible. 11. Implement traffic flow controls where road closure or partial road closure is unavoidable. This can either be in the form of providing alternative access routes via detours and/or the use of 1-way traffic flow control. 12. In the event of 1-way traffic flow control, trained personnel should be used to regulate the traffic to prevent severe delays at waiting points.	**DEV / C**	**Bi monthly**
Roads	13. Road rehabilitation should take place during and once construction is completed. 14. Construction traffic should only make use of an approved route.	**DEV / C**	**Bi monthly**

	15. The number of trucks that pass through communities should be kept to a minimum and should be restricted to certain times of the day, i.e. avoid peak hours when community members are on their way to or from school and work. 16. Traffic signs should warn construction vehicles of the presence of pedestrians and school children along the road. 17. General road rules should be enforced. 18. Implement traffic flow controls where road closure or partial road closure is unavoidable. This can either be in the form of providing alternative access routes via detours and/or the use of 1-way traffic flow control. 19. In the event of 1-way traffic flow control, trained personnel should be used to regulate the traffic to prevent severe delays at waiting points.		
Influx of construction workers	20. Raise awareness amongst construction workers about local traditions and practices. 21. Alert local businesses to the fact that construction workers will move into the area to enable local businesses to plan for the extra demand. 22. Ensure that the local community communicate their expectations of construction workers' behaviour with them.	**DEV / C**	**Bi monthly**
Influx of job seekers	23. Ensure that employment procedures / policy are communicated to local stakeholders, especially community representative organisations and ward councillors. 24. Have clear rules and regulations for access to the camp / site office to control loitering. Consult with the local SAPS to establish standard operating procedures for the control and/or removal of loiterers at the construction site. 25. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.	**DEV / C**	**Bi monthly**
Outflow of labourers	26. Implement methods (posters, talks, etc.) to create HIV and STI awareness amongst construction workers. 27. Develop skills transfer plans (e.g. portable skills training) that would enable a worker to move from one project to another project within the same area. 28. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 29. Where local labourers are employed on a more permanent basis, cognisance should be taken of the Labour Law in terms of registering the worker with the	**DEV / C**	**Bi monthly**

	Unemployment Insurance Fund (UIF), Pay as you earn (PAYE), workman's compensation and all other official bodies as required by law. This would enable the worker to claim UIF as a means of continuous financial support when the worker's position on the construction team has either become redundant or once the construction phase comes to an end.		
Direct formal Employment opportunities for local individuals	30. Unskilled job opportunities should be afforded to local community members. Local trade unions could assist with the recruitment process to counteract the potential for social mobilisation. 31. Equal opportunities for employment should be created to ensure that the local female population also have access to these opportunities. Females should be encouraged to apply for positions. 32. Individuals with the potential to develop their skills should be afforded training opportunities. Ekurhuleni Metropolitan Municipality should be involved in this process. 33. Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. This could include formal and/or informal training on how to look for alternative employment, information on career progression, etc. to ensure that people are equipped to seek other jobs with the skills that they have gained. 34. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 35. Where local labourers are employed on a more permanent basis, cognisance should be taken of the Labour Law in terms of registering the worker with the Unemployment Insurance Fund (UIF), Pay as you earn (PAYE), workman's compensation and all other official bodies as required by law. This would enable the worker to claim UIF as a means of continuous financial support when the worker's position on the construction team has either become redundant or once the construction phase comes to an end.	**DEV / C**	**Bi monthly**
Indirect formal and/or informal employment opportunities for local individuals	36. Develop a procurement policy that is easy to understand and ensure that local subcontractors also comply with the procurement policy and any other applicable policies. 37. Ensure that local subcontractors receive the necessary support in terms of resources. 38. Agree on specific performance criteria prior to appointment.	**DEV / C**	**Bi monthly**

	39. Identify the segment that might benefit from informal indirect opportunities, and assist them with skills development and subsidise initiatives that are sustainable. 40. Encourage construction workers to use local services. 41. Consider housing construction workers in local communities.		
Attitude formation against the project	42. Transparent information should be supplied to the community from the outset of the project. 43. The local community should play an active participatory role in the planning process, especially landowners of neighbouring properties. This could be achieved by means of establishing a community forum that meet quarterly or once a month to discuss issues and progress surrounding the project. 44. Employment opportunities should first be offered to the local community if the skills are available within the community. 45. Ekurhuleni Metropolitan Municipality should deliver on their undertakings with the community in terms of employment creation, etc. (tangible benefits to the community). 46. The undertakings in the EMPR should also be implemented effectively and with due diligence.	**DEV / C**	**Bi monthly**
Disaster Management Plan	47. Develop and implement an Emergency Response Plan for implementation during the construction phase. 48. Identify suitable individuals that can be trained and used as first aid officers on site (levels 1 to 3). Training of these individuals should ideally take place during this phase of the project to ensure that qualified first aid officers are on site once construction commences. 49. Consult with private ambulance services and/or hospitals so that they are aware of the project and would be able to provide emergency and/or medical services if needed. 50. Integrate risk management programmes with the IDP; 51. Maintain risk-specific safety infrastructure and plans – such as major accidents involving aircraft, railways and roads; 52. The Contractor to establish a fully functional and equipped emergency response centre for the R21 bulk water supply pipeline construction site 53. Establish disaster prevention programmes that focus on the most vulnerable communities – and, at the same time, support sustainable livelihoods;	**DEV / C**	**Bi monthly**

	54. Establish and maintain fire protection on the urban fringe; 55. Establish a culture of scientific risk analysis by investigating possible risk scenarios and developing standard operating procedures for such scenarios; 56. Establish and maintain multi-disciplinary co-operation and cooperative partnerships; 57. Establish pro-active media liaison; 58. Educate and inform surrounding communities and/or households on the standard operating procedures to follow during a suspected leak or other accidents. Ensure that these communities and/or households know who to contact in case of an emergency and are able to implement a step-by-step disaster management procedure; 59. The way in which the disaster management plan is communicated to the surrounding communities and/or households should be jargon-free and outline an easy to follow step-by-step procedure. Cognisance should be taken of the fact that some members of the surrounding communities and/or households are illiterate – make use of alternative communication methods (e.g. picture posters) to educate and inform these individuals;		
Pollution and fire risk	60. Sufficient portable chemical toilets on site and at the construction village. 61. Refuse on site should be discarded in sealed bins and/or covered skips. Refuse should be removed from the site on regular intervals (at least once a week) and disposed of at an approved waste disposal site. 62. Contractors are liable for the costs involved with connecting to the electricity network and the water services network. 63. Construction workers should only be allowed to make fire in designated areas. Disciplinary action should be taken against Construction workers who do not keep within designated areas.	**DEV / C**	**Bi monthly**
Sanitation	64. Construction workers should receive medical advice regarding correct sanitation and should receive medical attention where required. 65. Adequate water facilities should be provided. 66. Sufficient portable chemical toilets on site and at the construction village. 67. Adequate sanitation services (e.g. showers) at the construction camp with effective drainage facilities to ensure that used water is carried away from the site.	**DEV / C**	**Bi monthly**

Integration with local community	68. An aggressive STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole. 69. Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms should be approached with the necessary cultural sensitivity. 70. Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction site. 71. Local women should be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.	**DEV / C**	**Bi monthly**
Third party tampering	72. Conduct a vulnerability assessment to identify essential portions and dimensions of the bulk water pipeline that are particularly vulnerable to wilful damage. 73. Ensure that physical security systems and emergency tactical response measures are adequate and effective.	**DEV / C**	**Bi monthly**

Table 23: Visual Impact

IMPACT	**VISUAL IMPACT** This section deals with the visual impact that the new development will have on the site and surrounds	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / EO**	**Monthly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
74. General	75. Soften impact by use of landscaping 76. Fencing of the site will also aid in reducing the visual impact of construction. 77. Cluster construction activities on site. 78. Storage facilities, elevated tanks and other temporary structures on site should be located such that they have as little visual impact on local residents as possible.	**C / EO**	**Monthly**

	79. Unwanted material and litter should be removed on a frequent basis 80. Lighting must be subtle and not disturb passing motorists and surrounding residents. 81. Lighting should be inward and downward facing. 82. The site shall be kept visually and aesthetically pleasing, especially in and around the Contractor camp. The ECO shall regularly inspect the site to ensure that it is neat and clean. 83. Where required the campsite shall be screened by the Contractor to ensure that there is no unacceptable visual intrusion in the area of the site. Screening can be done by use of shade cloth.		

Table 24: Cultural and Heritage Artefacts

IMPACT	**CULTURAL AND HERITAGE ARTEFACTS** This section deals with the impact that the new development has on potential archaeological artefacts of the site	**RESPONSIBILITY**	**FREQUENCY / MONITORING REQUIREMENTS**
PHASE	**CONSTRUCTION**	**C / EO / ECO**	**Monthly**
ENVIRONMENTAL MANAGEMENT PROGRAMME			
	MITIGATION / METHOD STATEMENT		
General	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to GDARD. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 5. Should any archaeological sites / graves be uncovered during construction, their	**C / EO / ECO**	**Monthly**

	existence shall be reported to EMM immediately. 6. If grave sites are uncovered during construction, work must immediately be stopped in the area and the find must be reported to SAHRA as well as the South African Police Service for further investigation.		

Appendix A: Environmental Incidents Register

Date	Incident	Comments (Include any possible explanation for current condition and possible responsible parties. Include photographs, records etc. If available)	Mitigation Measure (Give details and attach documentation as far as possible)	ECO Signature

Appendix B: Complaints Register

Record of Complaints	Date:
Complaint:	
Capacity of complaint:	
Complaint recorded by:	
Corrective Measures:	

Name of ELO:	
Signature:	
Name of Site Manager:	
Signature:	
Name of Contractor	
Signature:	
Name of ECO:	
Signature:	
Notes:	