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Environmental Management Programme

PROJECT TITLE: Polokwane Municipality Urban Complex Groundwater Development and Distribution Project

TEKPLAN ENVIRONMENTAL CC

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ACRONYMS

LEDET	Limpopo Department of Economic Development, Environment & Tourism
EMPR	Environmental Management Programme
I&AP	Interested and/or affected party (i.e. the public, adjacent landowners and the property owner)
ROD	Record of Decision
EA	Environmental Authorisation
ECO	Environmental Compliance Officer
EO	Environmental Officer
EM	Environmental Manager

1. DEFINITIONS

1.1 DEFINITIONS

For the purpose of this document, the following definitions apply:

Audit

A systematic and, wherever possible, independent examination to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the organisation's policy and objectives

Continual improvement

Process of enhancing the environmental management programme to achieve improvements in overall environmental performance in line with the organisation's environmental policy

Documentation

Any written information describing, defining, specifying, certifying or reporting activities, requirements, policy or results

Environment

Surroundings in which the organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interaction

NOTE: Surroundings in this context extend from within an organisation to the global system.

Environmental aspect

Element of an organisation's activities, products or services that can interact with the environment

NOTE: A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact.

Environmental impact

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

Environmental Management Programme

A guideline document or directive, forming part of the overall management system, outlining the mitigation, monitoring and institutional measures to be taken during the;

- project implementation phase,
- project construction phase, and
- project operational phase,
- to avoid or control adverse environmental impacts – also including the actions needed to implement these measures.

Environmental objective

Overall environmental goal, arising from the environmental policy, that an organisation sets itself to achieve, and which is quantified where practicable.

Environmental performance

Measurable results of the environmental management system, related to an organisation's control of its environmental aspects based on its environmental policy, objectives and targets.

Environmental policy

Statement by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

Environmental target

Detailed performance requirement, quantified where practicable, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Hazard

A source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the work place environment, or a combination of these.

Hazard Identification

The process of recognising that a hazard exists and defining its characteristics

Incident

Undesired event that has the potential to lead to an accident

NOTE: Term "incident" includes both accidents as well as no-loss incidents, called "near-misses".

Inspection

Examination or measurement to verify whether an item or activity conforms to specified requirements, using the techniques of quality control.

Interested party

Individual or group concerned with or affected by the environmental performance of an organisation.

Mitigation measures

Mitigation measures encompass all actions taken to eliminate, offset or reduce potentially adverse environmental impacts to acceptable levels (World Bank, 1999:1).

Occupational Exposure

Occupational Exposure of adult workers who may be exposed to EMF under controlled conditions, in the normal course of and intrinsic to their particular employment. These workers will have been made aware of the potential risks of exposure and they will be able to take appropriate precautions.

Organisation

Company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

NOTE: For organisations with more than one operating unit, a single operating unit may be defined as an organisation.

Qualified Personnel

Characteristics or abilities gained through education, training and/or experience which enables an individual to carry out a specific task in accordance with specific requirements.

Risk

The combination of predicted frequency and consequences of a specified undesired event occurring due to the realisation of a hazard

Risk Assessment

The overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable

Safety

Freedom from unacceptable risk or harm

Site (also “The Site”)

All physical locations where contractors & sub-contractors will be performing tasks related to the tender/project allocated to them.

Tolerable Risk

A risk that has been reduced to a level that can be endured by the organisation having regard to its legal obligations and its own Occupational Health & Safety policy

Work Instructions

A document which sets out how a particular task is to be done, what is required and how it shall be recorded

2. EMPR BACKGROUND, PURPOSE & OVERVIEW

2.1 BACKGROUND

TEKPLAN ENVIRONMENTAL was commissioned by AURECON/ELEMENT CONSULTING ENGINEERS (on behalf of the POLOKWANE LOCAL MUNICIPALITY) to compile an Environmental Management Programme that would outline the,

- mitigation,
- monitoring and
- institutional measures,

to be taken during the planning & construction, to avoid and/or control adverse environmental impacts that could result.

The implementation of the EMPR by the contractors of the Polokwane local municipality will assist in minimising and managing the environmental impacts associated with the project.

This EMPR was developed to be a practical, flexible working document and is based on actual on-site analyses of prevailing circumstances and activities undertaken at the Site.

2.2 SCOPE & OBJECTIVES OF THE EMPR

It is essential to develop measures to eliminate, offset or reduce impacts on the environment during the implementation and operational phases of a project. The integration of such measures to protect the environment during the implementation and operational phase of a project, can be done by clearly defining environmental requirements within an Environmental Management Programme (or EMPR) (World Bank, 1999:1).

EMPR's provide a link between 1) the predicted environmental impacts (that will be induced by a certain development/project), and 2) implementation and operational activities.

Generally an EMPR performs the following functions;

- it outlines the anticipated environmental impacts of a project/activity,
- it outlines the measures to be taken to mitigate these impacts,
- it outlines responsibilities for mitigation of impacts.

Definition of an “Environmental Management Programme (EMPR):

An EMPR is a guideline document/directive outlining the mitigation, monitoring and institutional measures to be taken during project implementation, construction and operation to avoid or control adverse environmental impacts, as well as the actions needed to implement these measures (World Bank, 1999:1).

Definition of “mitigation measures”:

Mitigation measures encompass all actions taken to eliminate, offset or reduce potentially adverse environmental impacts to acceptable levels (World Bank, 1999:1).

The objectives of the EMPR are:

- to identify and manage the potential environmental aspects (impacts) that could result from the project at the SITE;
- to ensure that the environmental performance of all employees as well as suppliers and/or contractors, over which the company has control or can be expected to have an influence over, at least meet minimum environmental requirements when undertaking their activities;
- to establish and maintain a programme of remedial actions to address degradation of the environment that has resulted from past activities;
- to continually evaluate the effectiveness of the EMPR and make improvements where necessary.

3. EMPR

3.1 BACKGROUND

The Project is known as the Polokwane Municipality Urban Complex Groundwater Development and Distribution Project

Project description and location:

The project is located in the Polokwane Local Municipality area, Capricorn District, Limpopo Province. The purpose of the project is to supply additional water from several boreholes in the Polokwane and Seshego area to the existing bulk water supply system of the Polokwane Municipality. An extensive network of pipelines forms part of the project. The majority of pipelines will be constructed next to existing infrastructure (e.g. roads, railway lines, power lines and existing pipelines).

The project will consist of the following main components:

- Proposed construction of several pipelines (sizes with a diameter between 75mm and 500mm) from numerous boreholes to the existing bulk water supply network of the city.
- Two water treatment facilities respectively known as the Seshego and Sand River North Water Treatment Works (WTW) will also be constructed to treat the borehole water before it is supplied to the system. The Seshego WTW will have a capacity to treat 9ML/day and is located adjacent to the premises of the existing Seshego dam WTW (Remainder of the Farm Doorndraai 750 LS). The Sand River North WTW will have a capacity to treat 18ML/day and is located inside the premises of the existing Polokwane Waste Water Treatment Works (Remainder of Portion 28 of the Farm Doornkraal 680 LS).

The proposed pipelines, that will convey water from the boreholes to the above mentioned two Water Treatment Works, will be located in the following areas;

- Area between Penina Park and the Polokwane golf course;
- Area to the west of Westenburg, crossing Nelson Mandela Drive and Vermikuliet Street (adjacent to the Sand River);
- Area to the north of the Polokwane Waste Water Treatment Works (adjacent to the Sand River);
- Area between the Seshego dam and R521 (adjacent to the Blood River).

Pipelines will also connect the Sand River North WTW to the reservoirs in Potgieter Street as well the Krugersburg reservoirs at Sterpark (they will run along Beril & Veldspaat Streets). Further pipelines will also connect the Seshego WTW to reservoirs located to the west of Seshego H & Seshego E.

3.2 ENVIRONMENTAL MANAGEMENT PROGRAMME

3.2.1 INTRODUCTION

Mitigation seeks to find better ways of doing things, minimise or eliminate negative impacts, enhance project benefits and protect public and individual rights. The applicant/proponent has a responsibility to avoid or minimise impacts, and programme for managing impacts.

This report serves to prescribe measures to reduce, limit, eliminate or compensate for impacts, to acceptable/insignificant levels. The term 'mitigate' means to 'allay, moderate, palliate, temper, intensify'. In environmental terminology this term is used as follows:

- mitigation of a negative impact;
- to reduce the significance of an impact;
- mitigation/optimisation of a positive impact;

Hereunder the potential to mitigate each of the negative impacts identified will be discussed. Certain mitigation measures will be proposed and an indication will be given of how these proposed mitigation measures will influence the significance and status of each identified impact. Recommendations are arranged in order of sequence i.e. Planning/construction and Operational phases.

Mitigation should permeate through all stages of the development process. It is also essential that the mitigation programme be monitored during the construction and operational phases, to ensure compliance.

The stipulations of this report should be conveyed to contractors and persons responsible for construction. This report should be issued as a stand along document to

all parties involved with the planning, implementation and operation of the proposed project.

3.2.2 WHAT IS AN EMPR?

It is essential to develop measures to eliminate, offset or reduce impacts on the environment, to acceptable levels before the implementation and operational phases of a project commence. The integration of such measures to protect the environment during the implementation and operational phase of a project, can be done by clearly defining environmental requirements within an Environmental Management Programme (or EMPR) (World Bank, 1999:1).

EMPR's provide a link between 1) the predicted environmental impacts (that will be induced by a certain development/project), and 2) implementation and operational activities.

Generally an EMPR performs the following functions;

- it outlines the anticipated environmental impacts of a project,
- it outlines the measures to be taken to mitigate these impacts,
- it outlines responsibilities for mitigation of impacts.

Definition of an “Environmental Management Programme” (EMPR):

An EMPR is a guideline document/directive outlining the mitigation, monitoring and institutional measures to be taken during project implementation, construction and operation to avoid or control adverse environmental impacts, as well as the actions needed to implement these measures (World Bank, 1999:1).

Definition of “mitigation measures”:

Mitigation measures encompass all actions taken to eliminate, offset or reduce potentially adverse environmental impacts to acceptable levels (World Bank, 1999:1).

3.2.3 GEOGRAPHIC SCOPE OF THIS EMPR

This EMPR shall apply to all areas that will be affected by activities that will be undertaken as part of the project.

3.2.4 TIME FRAME OF THIS EMPR

This EMPR shall apply to all actions that will be undertaken between the date of issuing of the Environmental Authorisation (EA) and until the maintenance period after completion of construction has lapsed.

3.2.5 EMPR TO INFORM PLANNING

During planning and design, the proponent and its planning consultants and contractors, should take into account the recommendations of this EMPR so that it is positively utilized on a pro-active basis to aid in the mitigation of impacts.

3.2.6 EMPR TO CONTRACTORS (INCLUDING ENVIRONMENTAL AWARENESS PLAN)

The stipulations of this mitigation programme (EMPR) should be conveyed to contractors prior to the commencement of construction. Contractors should acknowledge receipt thereof in writing (this can be achieved by including this EMPR as an annexure to the tender and/or contract documents).

Environmental Awareness, in which the contents of this EMPR are explained to the contractor (including the site agent, CLO and Health & Safety officer), must be done by the appointed ECO (who will monitor compliance of the EMPR and conditions of the EA). The environmental risk which will result from the construction activities must then be communicated to the laborers during the daily/weekly toolbox talks.

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3.2.7 INCORPORATE RECOMMENDATIONS INTO CONSTRUCTION CONTRACTS

Construction-phase mitigation guidelines and clauses should be written into contract documents as specifications, in addition to the minimum requirements as set out in the SABS Standardised Specification for Civil Engineering Construction.

Additional clauses should be added as necessary in response to specific impacts that may be identified during the detailed design stage.

3.2.8 EMPR MONITORING

Implementation of this EMPR (adherence to this EMPR) should be monitored to ensure compliance. There should also be penalties for non-compliance.

3.2.9 NOTIFYING THE PUBLIC

Adjacent landowners and the public at large were informed of the proposed activity as part of the EIA process.

3.3 RECOMMENDED ENVIRONMENTAL IMPACT MANAGEMENT MEASURES

3.3.1 PLANNING PHASE MITIGATION GUIDELINES

3.3.1.1 Implementation recommendations

During planning and design the proponent and its consultants and contractors, should take into account the recommendations of this Environmental Management Programme, so that it is positively utilized on a pro-active basis to aid in the mitigation of impacts.

3.3.1.2 Incorporate recommendations into construction contracts

Construction phase mitigation guidelines and clauses should be written into contract documents as specifications, in addition to the minimum requirements as set out in the SABS Standardised Specification for Civil Engineering Construction.

Additional clauses should be added as necessary in response to specific impacts that may be identified during the detailed design stage. These conditions should be adhered to by all contractors and their compliance should be monitored on a continual basis.

3.3.1.3 The destruction of vegetation during initial investigations

Mitigation:

When visiting the site during the planning phase, use should be made of existing access roads as far as possible.

3.3.1.4 Uncertainty amongst local residents about who will benefit from the project

Mitigation:

Effective dissemination of the intentions of the proponent should take place throughout the area. Ongoing consultation with the community/local residents should take place. Prior to employment of individuals the proponent should liaise with the community/local residents. The Ward Councilors of the Municipality can assist the contractors with the consultation process.

3.3.2 CONSTRUCTION PHASE MITIGATION GUIDELINES

3.3.2.1 SITE ESTABLISHMENT

3.3.2.1.1 DEMARCATION OF THE SITE

Identify and demarcate the extent of the site and associated Works Areas (construction site).

In sensitive environments, or where access into no-go areas takes place, then a perimeter fence must be erected around the works area, the specification of which must be adequate to address the problem.

Maintain site demarcations in position until the cessation of construction works.

Maintain animal movement corridors as specified by the EO / ECO.

For pipelines, a servitude width of approximately 13.5m is permitted for machine excavation, and 6m for manual excavation, unless otherwise specified by the EO / ECO. This working servitude must accommodate all construction related activities, including materials storage, access routes etc.

In sensitive environments such as wetlands, rocky outcrops, indigenous forest, pristine grasslands and sensitive social environments, this working servitude may be reduced.

Minimise the extent of the Works Site footprint as much as is possible.

Maintain the demarcation line, and ensure that no personnel or construction materials move outside the designated site.

Do not use the site for any other purpose other than for the proper carrying out of the Works under the Contract.

Do not establish any site Works besides those specified and allowed for in the successful tender, unless specifically agreed upon with the EO / ECO.

Do not establish any activities or operations that, in the opinion of the EO / ECO are likely to adversely affect the aesthetic quality of the environment.

In the event that such activities and operations are deemed to be necessary, then ameliorative actions to reduce the adverse effects must be taken. Actions will be specified by the EO / ECO.

Use environmentally friendly, water based paint to mark natural features where necessary. Marking for surveying and other purposes must be done using pegs, beacons or rope and droppers.

3.3.2.1.2 PROTECTION OF VEGETATION AND NATURAL FEATURES

Identify, locate and map all plants and natural features to be protected during construction. These plants and features include, but are not limited to, Red Data Species, Protected Plants, Sensitive Communities, Riparian Vegetation, Wetlands, Drainage Lines and Aesthetically Significant Areas. Protect identified plants (at the distance of the outermost dripline) and natural features using barricade fencing like shade netting and steel droppers.

A survey to verify the occurrence of Protected trees should be undertaken before site clearing is to commence. An application for a license to damage/destroy Protected trees (in terms of Section 15(1) of the National Forests Act no 84 of 1998) should be submitted to the Department Agriculture, Forests & Fisheries and the license should be issued before any Protected trees may be damaged or removed.

Protected and Endemic plant species in terms of the Limpopo Environmental Act such as *Euphorbia clivicola* occur on a kopje at the Krugersburg Reservoirs near the pipeline route. During construction the area should be monitored to insure that these plants are not affected by construction activities.



Photo of *Euphorbia clivicola*

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Where damage to protected plants and natural features is a problem, then these should be fenced for protection.

Any large trees should be retained where possible to limit the impact on the direct environment.

Aloes and succulents should be replanted in the adjacent vicinity of the construction area. Large aloes can be replanted in such a manner as to screen the construction area.

Maintain plant demarcations in position until the cessation of construction works.

Locate construction camps on the outside fringe of the riparian vegetation zone.

The EO / ECO may add to this list, as long as motivation for doing so is in line with the criteria used to initially identify the plant or feature (i.e. either during the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant).

Do not disturb, deface, destroy or remove plants or natural features, whether fenced or not, for the duration of the Contractor's presence on site, unless otherwise specified by the EO / ECO.

The Contractor will be held liable for the replacement of any plant or feature under the protection of these specifications that is removed or damaged by the Contractor's negligence or mismanagement.

Do not remove any large tree without the permission of the EO / ECO. In all areas mark trees earmarked for removal prior to felling for approval by the EO / ECO.

No open fires are permitted under trees.

No material storage or laydown is permitted under trees.

Avoid locating buildings and structures (temporary or otherwise) under trees wherever possible.

No heavy equipment, machinery and vehicles may be parked under any tree, unless authorized by the ECO.

No vegetative matter may be removed for firewood on site.

3.3.2.1.3 PROTECTION OF FAUNA

Identify animal species, populations and nests to be relocated. Relocate affected fauna to areas where they will not be at risk. Plan such operations well in advance.

The pipeline located within the street reserve of Beril Street is located near the habitat for Giant bull frogs occurring in a minor drainage area near Eduanpark. The area must be avoided and will be monitored during construction.

No domesticated animals (i.e. chickens and pigs) are permitted at the construction site.

No wild animal may under any circumstance be handled, removed or be interfered with.

No wild animal may be fed on site.

No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. The Contractor will be held liable for the replacement of any animal injured or killed due to the construction activities.

Regularly undertake checks of the surrounding natural vegetation, in fences and along game paths to ensure no traps have been set. Remove and dispose of any snares or traps found on or adjacent to the site.

Ensure that the Work Site is kept clean, tidy and free of rubbish that would attract animal pests.

Have problem animals and vermin removed by an appropriate organization or authority (i.e. such as the Parks Board, the SPCA or a registered exterminator).

Ensure that domesticated animals belonging to the local community are kept away and are safe from any unprotected Works.

Do not make use of any pesticides, unless approved by the EO / ECO.

3.3.2.1.4 PROTECTION OF CULTURAL HISTORICAL ASPECTS

Identify, locate and map all features and sites of social and / or cultural historical significance to be protected during construction (as per the Heritage Impact Assessment Report). These features include, but are not limited to, inhabited houses, graves,

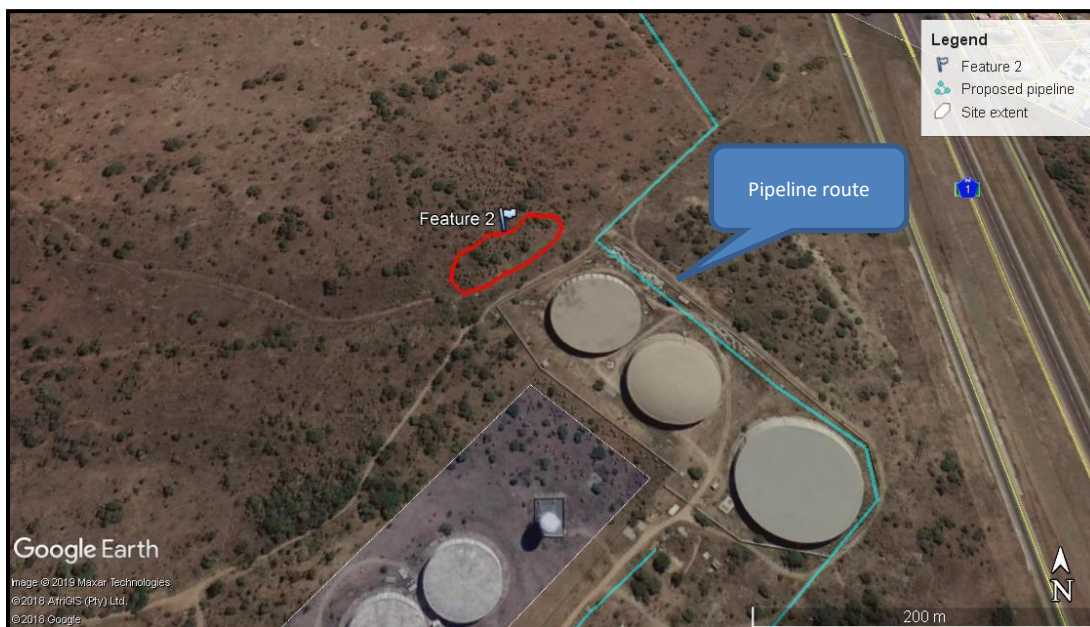
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historical structures, culturally significant sites (such as initiation schools) and archaeological finds. Protect identified features using barricade fencing like shade netting and steel droppers.

Where damage to protected features is a problem, then these should be fenced for protection.

Maintain demarcations in position until the cessation of construction works.

Do not disturb deface, destroy or remove protected features and sites, whether fenced or not, for the duration of the Contractor's presence on site, unless otherwise specified by the EO / ECO.



Identified Feature 2 (Late Iron Age stone walled site) in relation to the proposed pipeline. The site must be avoided.

If any chance archaeological finds, graves or skeletal material are unearthed, halt Works in that area immediately and inform the EO / ECO as per Change find Procedure indicated below.

Chance Find Procedures:

The following procedural guidelines must be considered in the event that previously unknown heritage resources or burial grounds and graves are exposed or found during the life of the project.

Initial Identification and/or Exposure (Chance Find):

If during the construction, operations, or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, find any artefact of cultural significance, this person must cease work at the site of the find. They must report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.

The initial procedure when such sites are found aim to avoid any further damage. If during the construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance the following steps and reporting structure must be observed in both instances:

- The person or group (identifier) who identified or exposed the heritage resource or burial ground must cease all activity in the immediate vicinity of the site;
- The identifier must immediately inform the senior on-site Manager of the discovery;
- The senior on-site Manager must make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area and ensure that the site is secured and control access;
- The senior on-site Manager will inform the ECO and Health and Safety (HS) officer of the chance find and its immediate impact on operations. The ECO will then contact the project archaeologist.

Chance Find Procedures: Heritage Resources:

In the event that previously unidentified heritage resources are identified and/or exposed during construction or operation of the project, the following steps must be implemented subsequent to those outlined above:

- The project archaeologist must be notified of the discovery;
- The project archaeologist will visit the site for a field based assessment of the finds and appropriate mitigation measures will then be presented to the developer;
- Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) Sections 34, 35, 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), the project archaeologist will notify the South African Heritage Resources Agency (SAHRA) and/or the Limpopo Provincial Heritage Resources Agency (LIHRA) on behalf of the developer; and
- Based on the comments received from SAHRA and/or LIHRA, the project archaeologist will provide the developer with a Terms of References Report and relevant associated costs if necessary.

Chance Find Procedures: Burials and Graves:

In the event that previously unidentified burial grounds and graves are identified and/or exposed during construction or operation of the project, the following steps must be implemented subsequent to those outlined above:

- The project archaeologist must immediately be notified of the discovery in order to take the required further steps:
 - The local South African Police Service (SAPS) will be notified on behalf of the developer;
 - The project archaeologist will inspect the exposed burial and determine in consultation with the SAPS if any additional graves may exist in the vicinity as well as the temporal context of the remains, i.e.:
 - forensic
 - authentic burial grave (informal or older than 60 years, NHRA (1999) Section 36); or
 - archaeological (older than 100 years, NHRA (1999) Section 38);
- Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) Section 36 and NHRA (1999) Regulations (Regulation 38, 39, 40), the project archaeologist will notify SAHRA and/or LIHRA on behalf of the developer;
- SAHRA/LIHRA may require that an identification of interested parties, consultation and /or grave relocation take place;
- Consultation must take place in terms of NHRA (1999) Regulations 39, 40, 42; and 5. Grave relocation must take place in terms of NHRA (1999) Regulations 34.

3.3.2.1.5 TOPSOIL CONSERVATION

Ahead of all construction, borrowing and quarrying, strip the entire available topsoil layer. Stockpile separately from overburden (subsoil and rocky material).

In the absence of a recognizable topsoil layer, strip the upper most 300mm of soil.

Co-ordinate Works to limit unnecessarily prolonged exposure of stripped areas and stockpiles. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.

Strip and stockpile herbaceous vegetation, overlying grass and other fine organic matter along with the topsoil.

Do not strip topsoil when it is wet.

Store stripped topsoil in an approved location and in an approved manner (refer to section 3.3.2.4 EXCAVATIONS and section 3.3.3 REHABILITATION PERFORMANCE SPECIFICATIONS) for later reuse in the rehabilitation process.

Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must preferably be site specific. If necessary keep a stockpile register.

Do not mix topsoil obtained from different sites.

3.3.2.1.6 DEBUSHING AND DESTUMPING

Obtain permission from the EO / ECO to proceed with debushing. Only debush specified areas.

Wood and plant material can be taken to a designated area where locals can collect it for fire wood.

Retain trees and stumps in remaining areas to function as refuges and habitats unless otherwise specified.

Utilise the method of debushing most appropriate for the environment and species in question. Favour mechanical rather than chemical methods wherever possible.

Where chemical methods are used, ensure that particular care is taken to avoid environmental damage. Manufacturers' instructions are to be adhered to at all times.

During felling and the clearing of woody vegetation, avoid the removal of and / or damage to the lower strata of vegetation, the basal grass cover and topsoil layer wherever possible.

Wood obtained from de-bushing and de-stumping remains the property of the landowner and must be stockpiled in areas designated by him and approved by the EO / ECO.

Where there is a need, stockpile brush wood of diameter less than 50mm for later use during rehabilitation.

Dispose of remaining plant material and stumps as solid waste. Upon approval by the EO / ECO, the plant material may be buried on site. Specifications for topsoil stripping, backfilling of excavations and rehabilitation will apply in this regard.

Environmental Management Programme

Only carry out de-stumping upon instruction by the EO / ECO. In all other instances trees must be cut as close as possible to the ground level and roots retained (for soil binding and habitat creation).

3.3.2.2 SITE INFRASTRUCTURE

3.3.2.2.1 STRUCTURES AND ACCOMMODATION

Locate all buildings and structures within predetermined zones as per the approved layout plan.

Locate all temporary (and permanent) labour housing within predetermined zones off site as per the approved Sketch Plans.

Secure housing sites using 1,2m high fence. In areas where security or theft is a problem, the fence height may be increased to 1,8m or even 2,4m and topped with razor wire. These fences are to remain in position until the cessation of Works.

Ensure that essential services (including showers, appropriate sanitation and drinking water facilities) are provided for all housing sites.

Maintain essential services in a functional state. These may not be overloaded. Defects and inadequacies must be rectified immediately.

Provide a designated place for food storage, preparation and consumption. Food storage must be separate from sleeping quarters and waste storage areas.

Service all labour housing with cooking facilities, preferably gas or electricity.

Allow for household amenities, such as washing and drying of clothes, as well as areas for social interaction (if necessary).

3.3.2.2.2 CONTRACTORS CAMP AND LAYDOWN AREAS

Only security and emergency personnel are to be housed on the construction site.

Locate all storage areas and material laydown sites within predetermined zones as per the approved layout plan.

Additional areas required by the contractor for laydown and storage must be approved by the EO / ECO.

Keep the camp and all its storage and laydown areas secure and neat at all times and employ appropriate access control measures during construction.

Clearly indicate which activities are to take place within which areas of the site.

Position security lighting so that it does not pose a nuisance to residential properties, tourist facilities or a danger to road users.

3.3.2.2.3 ROADS AND ACCESS

Develop all permanent and temporary roads and access routes as indicated on the approved Sketch Plans.

Slight deviations of alignment are permitted, so as to avoid significant vegetation specimens and communities, natural features and sites of cultural and historical significance. These deviations must be approved by the EO / ECO.

Make use of existing roads and tracks where feasible, rather than creating new routes.

Ensure that adequate vehicle turning areas are allowed for.

Where construction will obstruct existing access, be sure to allow for alternative temporary access routes.

In general, construction routes should not be wider than 3m in sensitive areas, with passing bays where two-way traffic is required.

Any additional routes and turning areas required by the contractor must be approved by the EO / ECO.

Plan additional access routes to avoid significant vegetation specimens and communities, natural features and sites of cultural and historical significance.

Routes should not traverse slopes with gradients in excess of 8%. Where this is unavoidable, stabilise the road surface.

Avoid planning routes through wetlands: seek an alternative route.

Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, constructed perpendicular to the drainage line. Avoid roads that follow drainage lines within the floodplain.

Where drifts are built through rivers, ensure that Reserve releases (i.e. for sustained downstream ecological requirements and basic human needs) are catered for and that no damming-up is experienced.

Adequate culverts are required as to have a minimal impact on water flow patterns through the drainage line.

Ensure that causeways result in minimal disruption to flow patterns, both upstream and downstream of the crossing, and do not cause damming of the water at the crossing.

Enforce speed limits at all times, both on public roads and on site roads.

Allow for safe pedestrian and cycling access and crossing where necessary.

Ensure that only authorised roads and access routes are used.

Vehicles may not leave the designated roads and tracks and turnaround points will be limited to specific sites.

Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing and maintain stormwater control mechanisms.

Runoff from roads must be managed to avoid erosion and pollution problems.

Regularly remove topsoil (and other material) accumulated in side drains of roadways to keep these open and functional.

Clear up any gravel or cement spillage on roads.

Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.

No offroad driving is permitted, unless authorised by the Project Manager.

Do not permit vehicular or pedestrian access into natural areas beyond the necessary work site.

Plan for proper access control where routes pass through pristine / sensitive areas, to prevent unauthorised and potentially environmentally destructive access by locals.

The Project Manager will indicate whether or not it is necessary to keep a photographic record of temporary or permanent rights of way over private property as permitted during construction.

3.3.2.2.4 GATES AND FENCES

Protect and maintain existing private property, fences and gates.

Respect the open or closed status of gates for the duration of the construction period.

Prevent unnecessary vehicular and personnel access into adjacent undisturbed areas.

In the interests of containing environmental damage and ensuring public and wildlife safety, it may be necessary to erect temporary fencing around the portion under construction.

For linear projects, small sensitive areas may be fenced where necessary, as the work site progresses.

Additional fencing may be specified by the Safety Officer or EO / ECO to counter problems arising on site. The contractor must erect such fencing and or gates when and where required by the EO / ECO, and re-erect and maintain temporary fencing and or gates as necessary.

Fences must be aligned to avoid significant vegetation specimens and communities, natural features sites of cultural and historical significance and animal movement corridors. All alterations must be approved by the EO / ECO.

Limit clearing for fencing to the removal of trees and shrubs within 1 m of the fence line. No removal of the grass cover or topsoil is to occur within this width.

Use shade cloth to screen Works Areas that are exposed to public areas and roads.

Retain temporary fencing and / or gates in position until replaced by permanent fencing or until the EO / ECO directs their earlier removal.

If temporary fencing and or gates are removed temporarily for the execution of any part of the Works then these must be reinstated as soon as practicable by the Contractor.

Fencing material used must be strong enough to prevent animals from gaining access to trenches. Fencing material should not pollute the environment as it disintegrates over time e.g. danger tape.

3.3.2.3 SITE MANAGEMENT

3.3.2.3.1 RUBBLE AND WASTE ROCK

Store inert building rubble and waste rock at designated areas.

Subject to approval by the EO / ECO and landowner, certain borrow pits and / or quarries may be utilised for the disposal of waste rock and inert building rubble.

If no on-site disposal opportunities exists, then rubble and waste rock must be disposed of at the nearest registered solid waste disposal facility.

3.3.2.3.2 SOLID WASTE

Collect all domestic waste in adequate numbers of litter bins/bags located as required on the Work Site and within the Contractors camp.

Where feasible, collect waste paper, glass and metal waste separately and arrange for collection by recycling contractors.

For linear projects, provide litter bins at regular positions.

Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out and to prevent animals from opening them.

Ensure that personnel make use of the litter bins provided. Keep all Work Sites, (especially areas where the labourers have lunch and tea) and at the Contractors camp tidy and litter free at all times.

Empty litter bins weekly (or as required before they reach capacity).

Where necessary, dedicate a storage area on site for the collection of construction waste.

Unless otherwise specified by the EO / ECO, remove stored domestic waste to the nearest registered solid waste disposal facility.

Ensure that solid waste is transported properly, avoiding waste spills en-route.

No solid waste may be burned on site.

3.3.2.3.3 LIQUID WASTE

Provide portable chemical toilets at all Work Sites, unless a connection to a sewer is possible, or a proper septic tank is installed.

Ensure that adequate numbers of conveniently located site toilets are available on all Work Sites at all times in quantities related to the number of users (1 toilet per 15 users is advised).

Do not locate any site toilet within the 1:100 year floodline, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland.

Maintain and clean site toilets regularly as is required to keep them in good, functional working order and in an acceptable state of hygiene.

Remove contents of toilets to the municipal waste water treatment facility.

Combine drinking water facilities with hand washing facilities near site toilets.

3.3.2.3.4 HAZARDOUS WASTE

Store hazardous waste in appropriately designated areas.

Ensure compliance with all national, regional and local legislation with regard to the disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.

Collect any hazardous waste in receptacles located on a drip tray on site pending disposal.

Have a hazardous waste spill kit available at the site.

Retain waste oils and batteries for recycling by the supplier wherever possible.

Regularly dispose of all hazardous waste not earmarked for reuse, recycling or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals and fluorescent tubes) at a registered hazardous waste disposal site.

Contain chemical spills, and arrange for cleanup / control by the supplier, or by professional pollution control personnel.

3.3.2.3.5 POLLUTION CONTROL

Do not locate any reservoir, dam or depot for any substance which causes or is likely to cause pollution within the 1:100 year floodline, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland.

Do not dump waste of any nature, or any foreign material into any drainage line or wetland.

Do not allow the use of any drainage line or wetland for swimming, bathing, or the cleaning of clothing, tools or equipment.

Prevent the discharge of water containing polluting matter or visible suspended materials directly into drainage lines or wetlands.

Deflect any unpolluted water / runoff away from any dirty area (including plants, maintenance areas, workshops and contractors yards).

Otherwise clean, but silt laden water may be discharged overland, provided no erosion is resultant from this discharge.

Where necessary, turbid water pumped from excavations within rivers must be passed through a sand filter or settling pond before being released back into the river. Discharge of this water must be in a controlled manner, and no erosion may result.

Ensure that no stormwater is allowed to enter any drainage installation for the reception, conveyance, storage and / or treatment of sewage.

Water may only be discharged into a stormwater or sewer system with the permission of the local authority.

Immediately clean any accidental oil or fuel spills or leakages.

Do not hose oil or fuel spills into a storm water drain or sewer, or into the surrounding natural environment.

Clean small oil or fuel spills with an approved absorbent material which forms part of the spill kit.

Contain oil or fuel spills in water using an approved oil absorbent fibre.

Treat soil contaminated by oil or fuel using one of the following approved methods, as per instruction of the RE / EO / ECO:

- a) Remove the soil to the depth of the contamination and dispose of at a registered Hazardous Waste Disposal Site.
- b) Remove the soil to the depth of the contamination, and regenerate using approved bio-remediation methods.

Report major oil or fuel spills to the provincial Department of Water and Sanitation, as well as to the relevant Local Authority.

Carefully control all on-site operations that involve the use of cement and concrete (this applies to areas other than the batching plant).

Limit cement and concrete mixing to single sites where possible.

Use plastic trays or liners when mixing cement and concrete: Do not mix cement and concrete directly on the ground.

Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste).

Contain water and slurry from cement and concrete mixing operations as well as from batching area wash bays. Direct such waste water into a settlement pond or sludge dam for later disposal.

Do not allow the washing of trucks delivering concrete anywhere but within designated wash bays equipped with runoff containment. Direct such waste water into a settlement pond or sludge dam for later disposal.

3.3.2.3.6 BLASTING

The specifications included under this section do not exempt the Contractor from complying with all the Regulations as included in the Explosives Act (Act No. 15 of 2003). The contractor is further referred to this Act and all its regulations.

Plan the type, duration and timing of blasting procedures with due cognisance of other land uses and structures in the vicinity.

Inform local landowners and communities ahead of any blasting event.

"When blasting is to be carried out within 500m of any building, railway, public thoroughfare, powerline, telephone line, pipeline, sports field or any place where people congregate, then these must be inspected and their condition photographically recorded prior to blasting. The provisions and requirements of the relevant authorities must be complied with. These include:

- Spoornet concerning railways;
- The South African Roads Agency concerning national roads;
- Eskom concerning powerlines;
- Telkom concerning telecommunications lines;
- Water boards and local authorities, concerning the protection of water mains, gas mains, sewers and sewerage mains and electric cables;
- Any other authorities who have jurisdiction in the area."

Favour the use of nitrate-free explosives wherever possible (i.e. methods including as drilling and black powder, expanding mortar or old fashioned plugs and feathers).

Make use of noise mufflers and / or soft explosives during blasting.

When blasting, take measures to limit flyrock.

Give audible warning of a pending blast at least 3 minutes in advance of a blast.

Collect and remove all flyrock (of diameter 150mm and larger) which falls beyond the cleared working area, together with the rock spill.

3.3.2.3.7 AIR QUALITY

Manage dust resultant from the Works and fugitive dust in an efficient and environmentally sensitive manner.

Limit the production of dust and damage caused by dust through regular watering of the work areas.

Speed of haul trucks and construction vehicles can be reduced to limit excessive dust creation.

Ensure that a dust control system (i.e. sprinkler or vacuum) is installed and maintained in an operating condition at the crusher/sifting plant.

Dust from the construction site must not disturb economic or social activities (including schooling and sporting activities) in the vicinity of the construction site.

No fires are allowed on site.

Construction vehicles should be maintained in good working order to not produce excessive smoke.

3.3.2.3.8 NOISE CONTROL

Unless otherwise specified by the EO / ECO, normal work hours will apply (i.e. from 06h30 to 17h00, Mondays to Saturdays).

Ensure that employees and staff conduct themselves in an acceptable manner while on site, both during Work hours and after hours.

No loud music is permitted on site or in the Camp site.

If noise levels at the boundaries of the site exceed 7dB above ambient levels, then the local health authorities are to be informed.

Notify adjacent landowners of after-hours construction Work and of any other activity that could cause a nuisance.

Respond to community complaints with regard to noise generation, taking reasonable action to ameliorate the impact.

3.3.2.3.9 FIRE CONTROL

Take adequate precautions to ensure that fires are not started as a result of Works on site: the Contractor will be held liable for any damage to property adjoining the Site as a result of any fire caused by one of his employees.

Establish and maintain fire breaks around the Work Sites if as and when specified by the EO / ECO and as required by applicable legislation and the local authority.

Do not permit any fires or open flames in the vicinity of a wetland, especially during the dry season.

A minimum requirement for construction in a high fire risk area is a water truck or cart, with a minimum capacity of 5000 litres, equipped with pump and hose (minimum length 30m) which must be permanently on site.

Ensure that the Work Site, the contractors' camp and all living quarters are equipped with adequate fire fighting equipment. This includes at least rubber beaters when working in veld areas, and at least one fire extinguisher of the appropriate type irrespective of the site.

Take immediate steps to extinguish any fire which may break out on the construction site.

No open fires are permitted anywhere on site.

Restrict contained fires for heating and cooking (i.e. in a fire drum) to designated areas on site. Prevent employees from creating fires randomly outside designated areas.

Do not store any fuel or chemicals under trees.

Do not store gas and liquid fuel in the same storage area.

Do not permit any smoking within 3m of any fuel or chemical storage area, or refueling area.

3.3.2.3.10 HEALTH & SAFETY

The specifications included under this section do not exempt the Contractor from complying with all the Regulations as included in the Occupational Health and Safety Act (Act 85 Of 1993). The contractor is further referred to this Act and all its regulations.

The safety of all construction and operational personnel, as well as any member of the public on the site is the responsibility of the Contractor.

Control access onto and off the site by means of a register system. This includes visitors.

Ensure that first aid / emergency facilities / procedures are in place.

Ensure that all personnel are trained in basic site safety procedures.

Keep a register with contact numbers of all people employed and one relative for each.

Keep a list of all relevant emergency numbers in an easily accessible location on site.

Keep a record of all incidents, accidents and illnesses on site and make the information available at meetings.

Ensure that proper footwear is worn by employees at all times.

Ensure that employees are issued with and make use of the necessary safety equipment when working in dusty, noisy and / or dangerous situations. Such equipment may include, but is not necessarily limited to hardhats, goggles, masks, earplugs, gloves, safety footwear and safety ropes as required.

Ensure that adequate drinking water, wash water and sanitary facilities are available at all times and on all work sites.

Where necessary, provide a designated place for food storage, preparation and consumption on site. This should be a shaded area.

Ensure that personnel are transported legally, and in a safe and responsible manner.

Ensure that all vehicle and machine operators are qualified and licensed to operate their vehicles / machines.

Protect dangerous excavations or Works that may pose a hazard to humans and animals. Demarcate these areas with fencing as required and post the appropriate danger signs. Respect workers' right to refuse work in unsafe conditions.

3.3.2.3.11 OPTIMISATION OF THE LOCAL ECONOMY

Where appropriate, use should be made of labour intensive construction methods - local emerging contractors should be used as well as sourcing labourers from the nearby villages/towns.

Optimal benefit can be derived in the local economy by the preferential employment of local tradesmen and sub-contractors.

Sourcing of raw materials and construction materials should take place in the local and sub-regional economy.

3.3.2.3.12 UNSOCIAL ACTIVITIES ON SITE

Implementation of security on the construction site is necessary. Only authorised persons should have access to the site. The site needs to be properly secured for the duration of the construction period and strict control of labour implemented.

Prostitution, drinking, crime, vandalism etc. generally only arise where labourers are away from home. If the majority of the labour force is recruited locally, incidence of prostitution and other un-social activities could be reduced.

Transportation of labour to and from the site, should take place in an orderly manner to discourage loitering on adjacent areas and possible increase in crime.

3.3.2.4 EXCAVATIONS AND TRENCHES

Undertake excavations carefully, incorporating appropriate drainage.

For significant trees (as indicated by the EO / ECO), trenching must be 3m away from the stem.

Excavate and backfill trenches on a progressive basis (if possible).

Ensure that no trench longer than 1000m is exposed at any one time (if possible).

Limit the amount of time that the trenches are open as much as possible.

Programme excavation to take place once the required materials are on site. This facilitates the immediate laying of services and/or construction of subsurface infrastructure and minimises open trench time.

Exit ramps should be constructed at regular intervals to provide escape routes for small animals, reptiles, amphibians.

Corridors should be provided at strategically placed intervals to provide land animals safe access across the pipeline construction route.

Trenching through wetlands and drainage lines may only be undertaken upon instruction by the EO / ECO. In such a situation be sure to return the profile of the wetland / drainage line to one similar to the pre-construction profile. No ridge or channel feature may remain.

During construction through a wetland, the majority of the flow of the wetland must be allowed to pass down the stream (i.e. no damming must be allowed to take place). In-stream diversions should be used rather than the construction of new channels.

3.3.2.5 STOCKPILES, STORAGE AND HANDLING

3.3.2.5.1 TOPSOIL

Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.

Position topsoil stockpiles separately from the excavated soil.

Ensure that all topsoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.

In linear projects, stockpile topsoil in windrows parallel to the excavation.

In riverine areas, stockpile topsoil above the riverine zone.

Remove exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles.

If topsoil is to be stockpiled for extended periods, especially during the wet season, then the ECO may recommend one of the following measures:

- The re-vegetation of the stockpiles with indigenous grasses.
- The covering of the stockpiles with a protective material such as hessian mats.

Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.

The Contractor will be held liable for the replacement of any topsoil rendered unsuitable for use during rehabilitation, for reasons due to his negligence or mismanagement on site.

3.3.2.5.2 SPOIL

Position spoil (excavated subsoil) next to the excavation area e.g. trench.

Spoil material should not damage existing structures like fences, walkways, roads etc.

Spoil material should be placed at least 1 meter away from the edge of the trench to prevent the walls of the trench from collapsing.

Any additional spoil storage area required by the contractor must be approved by the EO / ECO. The following information may be required for approval:

- The location, description of and access to proposed sites.
- The quantity of material to be stored as spoil.
- The types of material to be stored as spoil (i.e. blast rock, excavated rock, subsoil etc.).
- The proposed method of storing spoil.
- A proposal for the reinstatement and rehabilitation plan, including the final profile.

- Written approval from the landowner / relevant authority that material may be stored on the land in question, subject to conditions.

In linear projects, spoil must be positioned in windrows parallel to the excavation.

Position spoil on the higher side of a disturbed area, and above a 1:20 year flood line wherever possible.

Ensure that all spoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.

Store spoil in low heaps, not exceeding 2m in height.

Do not store spoil in drainage lines.

Properly rehabilitate any permanent spoil dumps as soon as work in that area is complete.

In general, no slopes steeper than 1(V):3(H) will be allowed.

Bury the coarser material beneath the finer material, and overlay all permanent spoil heaps with a layer of topsoil at least 200mm thick.

3.3.2.5.3 VEHICLES AND EQUIPMENT

Vehicles used during construction must have the minimum impact on the environment or other road users. The size, height and weight of the vehicle must be kept in mind.

Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid.

No vehicles, machinery or equipment with leaks or causing spills may be allowed to operate on the construction site. These must be sent to the maintenance yard or workshop for repair, or must be removed from site.

Ensure that the maintenance of all vehicles and equipment, including oil and lubricant changes, takes place only within properly equipped, bunded maintenance areas or workshops.

Only emergency and essential repairs of vehicles and equipment may take place on site.

Provide drip pans for generators, or any machinery that will be in position for longer than one day.

Drip trays are to be watertight, and must be emptied regularly and before rain events. The contents of drip trays are to be treated as hazardous waste.

Day to day parking of vehicles is to be on hard surfacing wherever possible.

Where oil and fuel spills are expected, parking is to be on an impervious surface with adequate pollution control mechanisms in place.

3.3.2.5.4 FUEL

Do not locate any fuel depot within the 1:100 year floodline, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland.

Store fuel at temporary depots within a bunded area, or alternatively in an area underlain by heavy duty PVC sheeting and covered with 100mm of sand. This is to include an area adjacent to the tanks upon which vehicles must park during re-fuelling.

Provide impervious paving adjacent to fuel tanks, upon which vehicles must park during re-fuelling. This will help to accommodate fuel spills during re-fuelling.

The only permitted method of fuel transfer, is by means of a pump / controlled valve / tap / hose / funnel.

Treat spills within the bund and the contents of the sump as hazardous waste.

3.3.2.5.5 HAZARDOUS SUBSTANCES

Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents, explosives and any other harmful and hazardous substances and materials.

Position hazardous substance stores in areas not threatening human life or the environment.

Keep a record of all hazardous substances stored on site for submission to the EO / ECO.

Store all hazardous substances in secure, safe and weatherproof facilities, underlain by a bunded concrete slab to protect against soil and water pollution.

Clean any accidental spills immediately, treating the spilled material and used cleaning products as hazardous waste.

Provide for controlled loading / unloading areas, underlain by an impervious paving or PVC sheet to protect against soil and water pollution.

Ensure that personnel handling hazardous substances have been educated in terms of the correct handling, use and disposal thereof.

Empty containers in which hazardous substances were kept are to be treated as hazardous waste.

3.3.2.6 EROSION CONTROL

3.3.2.6.1 SURFACE WATER MANAGEMENT

No water may be abstracted from any surface water body for the purpose of construction unless permitted in terms of the Contract, or specifically authorised by the EO / ECO.

Where possible, recycle water on the construction site.

Avoid over-wetting, saturation and unnecessary runoff during dust control activities and irrigation.

Do not drain, fill or alter in any way, any wetland or drainage line, including the riverbanks unless this forms part of the construction Works, or upon specific instruction by the EO / ECO.

Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes or along pipeline routes without erosion protection measures being in place.

Line overflow and scour channels with stone pitching along their length and at their points of discharge to prevent soil erosion. The point of discharge must be at a point where there is dense natural grass cover.

Ensure that channels do not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient.

Ensure that overland discharge occurs over areas that have a minimum cover of 90% grass cover at a minimum height of 150mm. This applies to areas downslope of the discharge point as well.

Where possible, undertake river diversions outside of the rainy season.

It is recommended that the corridor cleared must be as narrow as possible – only wide enough for the insertion of the pipeline, where the pipeline will cross drainage channels.

The rehabilitation must include stabilisation of the stream banks to ensure no erosion occur in future. Standard procedures must be followed – i.e. stabilisation of the stream banks, rehabilitation during and after construction and the use of silt traps during the construction.

3.3.2.6.2 EROSION PROTECTION

Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.

Retain natural trees, shrubbery and grass species wherever possible.

Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the Work Area.

Avoid access into seasonally wet areas and / or turf soils during and immediately after rainy periods, until such a time that the soil has dried out.

Utilise only light equipment for access and deliveries into areas of unstable soils, in areas where erosion is evident, and at stream and river embankments.

Limit vehicular access into rocky outcrops and ridges.

Institute adequate sedimentation control measures at river crossings and when excavation or disturbance within riverbanks, or the riverbed takes place.

Address erosion donga crossings as river crossings, applying soil erosion control and bank stabilisation procedures as specified by the EO / ECO.

Do not allow erosion to develop on a large scale before effecting repairs. When in doubt, seek advice from the EO / ECO.

Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.

In general, slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or sandy, must be stabilised. The EO / ECO will specify a solution in terms of the most appropriate approved method and technology. One or more of the following methods may be required:

- Topsoil covered with a geotextile, plus a specified grass seed mixture.
- A 50:50 by volume rock:topsoil mix 200mm thick, plus specified grass seed mixture.
- Logging or stepping (logs placed in continuous lines following the contours).
- Earth or rock-pack cut-off berms.
- Benches (sand bags).
- Packed branches.
- Ripping and scarifying along the contours.
- Stormwater berms.

Near vertical slopes of 1(V):1(H) or 1(V):2(H) must be stabilised using hard structures, preferably with a natural look, and with facilities allowing for plant growth. The EO / ECO will specify a solution in terms of the most appropriate approved method and technology. One or more of the following methods may be required:

- Retaining walls (loffel or otherwise)
- Stone pitching
- Gabions
- Shotcrete

Protect the slopes of all river diversions. One or more of the following methods may be used, as specified by the EO / ECO:

- Sandbags
- Reno mattresses
- Plastic liners and / or coarse rock (undersize rip-rap)

During the course of construction, the EO / ECO may identify additional slopes in need of stabilisation and will specify actions in terms of the most appropriate approved method and technology.

3.3.2.6.3 CONTROL OF ALIEN PLANTS

Identify, locate and map all exotics and invasive plants to be eradicated.

Control exotics and invasive plants to be eradicated. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.

Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.

Follow manufacturers instruction when using chemical methods, especially in terms of quantities, time of application etc.

Ensure that only properly trained people handle and make use of chemicals.

Dispose of the eradicated plant material at an approved solid waste disposal site. If no toxic sprays or persistent poisons were used during eradication, then the wood may be sold or donated.

Rehabilitate all identified areas as soon as practically possible, utilising specified methods and species.

3.3.3 REHABILITATION PERFORMANCE SPECIFICATIONS

3.3.3.1 REMOVAL OF STRUCTURES AND INFRASTRUCTURE

Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, fixtures and any other temporary Works.

Materials that will not be used again must be sold if possible or rehabilitated to blend in with the surrounding landscape.

Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.

3.3.3.2 INERT WASTE AND RUBBLE

Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates.

Load and haul excess spoil and inert rubble to fill in borrow pits / dongas or to dump sites indicated / approved by the EO / ECO.

Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.

Subject to approval by the EO / ECO, certain borrow pits and / or quarries may be utilised for the disposal of waste rock and inert building rubble.

3.3.3.3 HAZARDOUS WASTE AND POLLUTION CONTROL

Remove from site all temporary fuel stores, hazardous substance stores, hazardous waste stores and pollution control sumps. Dispose of hazardous waste in the approved manner.

Remove from site all pollution containment structures. Dispose of materials that will not be used again as hazardous waste.

Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.

3.3.3.4 FINAL SHAPING

Backfill all prospecting boreholes, excavations and test pits with in-situ material.

Make safe all borrow pits, quarries and dangerous excavations by backfilling, grading and blasting as required.

In general, no slopes steeper than 1(V):3(H) are permitted, unless otherwise specified by the EO / ECO. Steeper slopes require protection. The rationale is that the new slopes must mimic the natural slopes and topography.

Where possible, programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.

Deficiency of backfill may not be made up by excavating haphazardly within the Work Site. Additional fill may only be imported from approved borrow areas as indicated by the EO / ECO.

Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.

Dismantle and flatten temporary drifts and river crossings, reinstating all drainage lines to approximate their original profile.

Shape all disturbed areas to blend in with the surrounding landscape.

Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is smoothed over to blend in with the surrounding landscape.

3.3.3.5 TOPSOIL REPLACEMENT AND SOIL AMELIORATION

The principle of Progressive Reinstatement must be followed wherever possible. This includes the reinstatement of disturbed areas on an ongoing basis, immediately after the specified construction activities for that area are concluded.

Execute top soiling activity prior to the rainy season or any expected wet weather conditions.

Execute topsoil placement concurrently with construction where possible, or as soon as construction in an area has ceased.

Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes and roads to the original depth (i.e. as much as was removed prior to construction). These areas will be quantified by the EO / ECO.

Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality. The EO / ECO will advise.

The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage, and approved by the EO / ECO.

Do not use topsoil suspected to be contaminated with the seed of alien vegetation (i.e. black wattle). Alternatively, the soil is to be sprayed with specified herbicides (ECO to specify).

Shape and mound topsoil to 200mm from the top of manholes and valve chambers which protrude above ground and over pipelines to facilitate subsequent consolidation of the backfill.

Ensure that storm water run-off is not channeled alongside the gentle mounding, but that it is taken diagonally across it.

Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.

After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

3.3.3.6 RIPPING AND SCARIFYING

Rip and scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. The EO / ECO will specify whether ripping and scarifying is necessary, based on the site conditions immediately before these works begin.

Rip and scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the Works.

Rip and scarify along the contour to prevent the creation of down-slope channels.

Rip and scarify all areas at 300mm intervals (but not more than 400mm intervals), ensuring that the lines overlap. Do not rip and scarify areas under wet conditions, as the soil will not break up.

3.3.4 OPERATIONAL PHASE MITIGATION GUIDELINES

The following section will address a range of mitigation actions that might manage the predicted impacts associated with the operation of the different components of the development.

3.3.4.1 MAINTENANCE

Allow for a maintenance period of one year following practical completion, unless otherwise specified.

Landscape maintenance is to be undertaken by suitably qualified persons, making use of the appropriate equipment.

Cordon off sensitive areas that are under rehabilitation as no-go areas using shade netting to prevent vehicular, pedestrian and animal access.

Delay the re-introduction of stock to all rehabilitation areas until an acceptable level of re-vegetation has been reached. Fencing may be used, or the area may be covered by branches.

Re-vegetation must match the vegetation type which previously existed, unless otherwise indicated in the Contract or specified by the EO / ECO.

Base the new carrying capacity of rehabilitated land on the status quo rather than the regional estimate.

Control weeds by means of extraction, cutting or other approved methods. Regulation 15 of the Act on the Conservation of Agricultural Resources (as amended), Act No. 43 of 1983, determines that the establishment of declared weeds and invasive plants during and after development should be prohibited.

For planted areas that have failed to establish, replace plants with the same species as originally specified. The same species as originally specified must be used unless otherwise specified by the EO / ECO.

A minimum grass cover of 80% is required, and individual plants must be strong and healthy growers at the end of the Maintenance Period.

In the case of sodding, acceptable cover entails that 100% cover is attained by the specified vegetation.

Bare areas that show no specified vegetation growth after three months of the Rehabilitation Work are to be spread with additional topsoil, ripped to a depth of 100mm and re-planted, re-sodded, re-hand sown or re-hydroseeded.

The sludge from the sludge ponds generated from the water treatment facilities should be classified before being disposed to an accredited landfill site.

3.3.5 DECOMMISSIONING PHASE

Should the facility for any reason be closed, an Environmental Management Programme relating to the rehabilitation of the area shall be submitted to LEDET for approval.

3.4 MONITORING & REPORTING

For the purposes of this document environmental monitoring is defined as “the repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures”.

Monitoring has a smaller scope, usually at a project or programme level. Monitoring is undertaken on an ongoing basis for the duration of the project, programme or activity – usually before, during, and after implementation of each project or programme.

3.4.1 Compliance Monitoring (Regulatory Permit Monitoring)

Environmental protection and management can be ensured through the monitoring of compliance by a regulating organisation such as Department of Environmental Affairs. Compliance with environmental laws, regulations, permits, licenses etc., is controlled through effective monitoring and compliance assessment. Such compliance must be monitored to ensure that control mechanisms have the desired effect.

Compliance monitoring aims to:

- Determine compliance with applicable laws, regulations, permit conditions, orders and settlement agreements;
- Review and evaluate the activities of the regulated body; and
- Determine whether or not conditions presenting imminent and substantial endangerment may exist.

Compliance monitoring consists of a wide range of activities in six basic categories which may overlap:

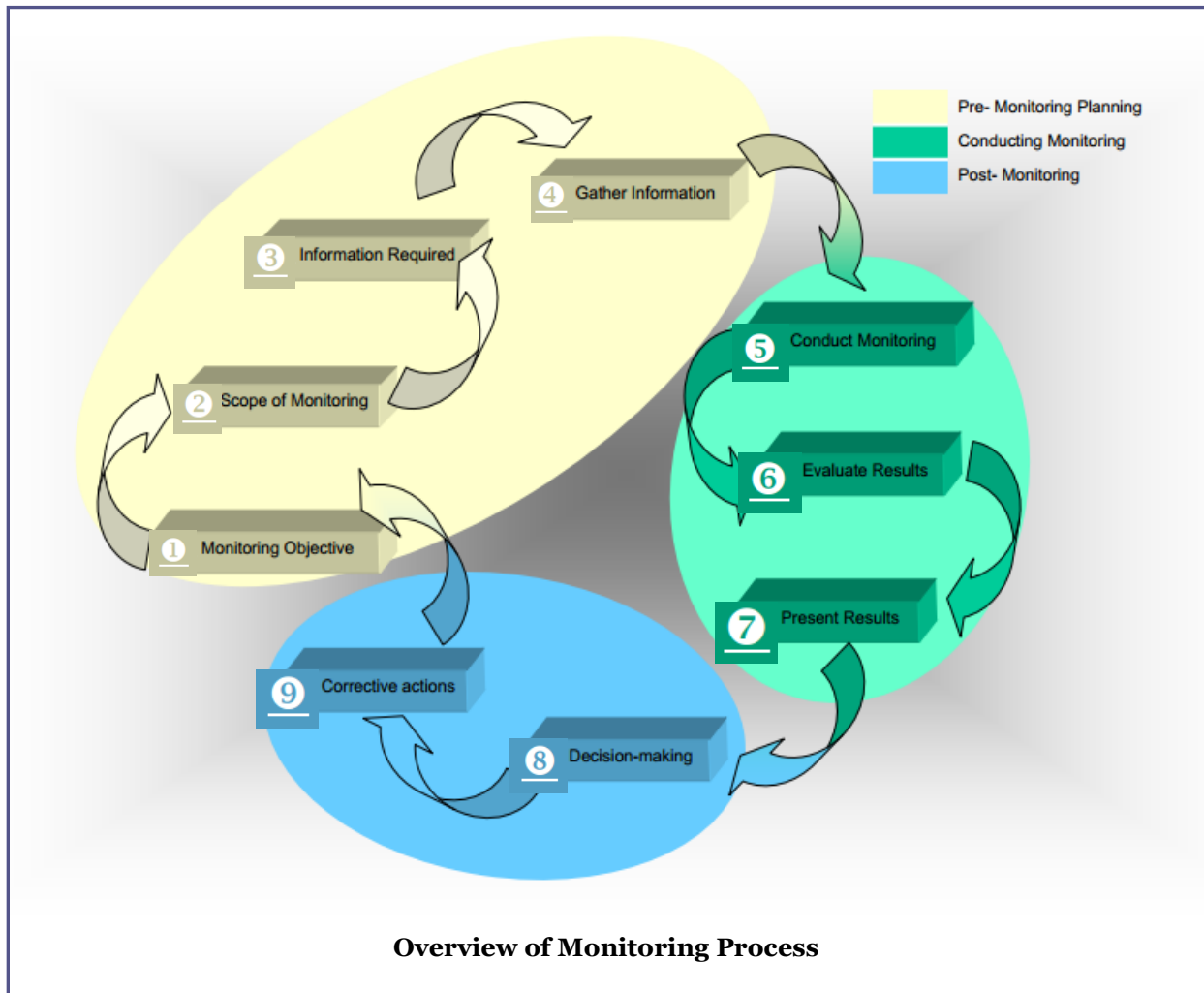
1. Surveillance - a pre-inspection activity to obtain general site information prior to entering the site;
2. On-site inspections may include record reviews, observations, sampling, interviews, etc., and may have different foci.
3. Investigations are more detailed inspections and may be needed if an inspection or record review suggests the potential for serious, widespread, and/or continuing violations.
4. Record reviews may be conducted at the regulator's offices, or at the site, and may or may not be combined with fieldwork.
5. Records may be derived from routine self-monitoring requirements, inspection reports or remote sensing.
6. Targeted information gathering may be used to provide or acquire more accurate information on the status of compliance and/or environmental conditions.

3.4.2 Generic Monitoring Process

The purpose of monitoring is to follow changes over a period of time and to assess the efficiency of control measures, through a process of repetitive and continued observation, measurement and evaluation of environmental data. Checklists are the most widely used monitoring tools however other monitoring tools include electronic

decision support instruments, online digital monitoring instruments and before and after pictures.

The monitoring process is designed such that the process is applicable at a strategic, programme or project level. Specific indicators need to be monitored regularly to ensure that projects/programmes, are socially, environmentally and ecologically sustainable. Further, the monitoring process is applicable to all types of monitoring.



(Department of Water Affairs, 2005)

Step 1

Monitoring objectives need to be determined, bearing in mind the environmental goals and objectives of the EMPR and the Environmental Authorisation (EA once issued).

Legislation, regulations and best practices should also be borne in mind when determining objectives. Examples of monitoring objectives could include:

- ensuring legal compliance, for instance monitoring to ensure that permit conditions are met or compliance to the EMPR, EIA, etc. (compliance monitoring);
- monitoring of pre-determined indicators e.g. ensuring that the water in a river downstream of a dam is of the correct quality and quantity; (baseline monitoring)
- ensuring that environmental programmes are effective and used correctly for their intended purpose (programme evaluation monitoring);
- reduce environmental liability on an environmentally sensitive project (e.g. monitoring of suitable indicators may allay the public's concerns, cumulative impact monitoring);
- Periodic inspection of a project to ensure compliance with the EMP, rehabilitation specifications and best practices (inspection monitoring)
- or a combination of the above.

Once the objective has been determined, appropriate checklists and other tools can be used.

Step 2

Before monitoring can begin, the scope must be clearly defined, based on the objectives. Usually only one project or programme is monitored at a time.

Step 3

The general information that will be required includes the details of the actual project. The following information may be needed:

- what is the purpose of the project?
- what type of project is it?
- copy of the EA, EMPR, EIA report, etc.
- what activities are involved, etc.

If indicators are being monitored, background information is also required regarding the indicators to be monitored and tools that will be used during the project. Information on the targets and timeframes associated with each indicator is required.

Step 4

Depending on the objective of the monitoring, a variety of tools can be used to assist in monitoring. Checklists are often used to gather information during monitoring. The checklists could be used for monitoring however one would need to adapt the checklists

for specific types of monitoring. Additional checklists may need to be designed for the different types of monitoring.

Suitable monitoring points for each indicator should be identified at the project site or in nearby areas as required. Suitable intervals for monitoring each indicator should be determined. The project team should be made aware of what types of monitoring will be carried out during the project, and when and where the monitoring would occur in order to monitor the correct information.

Monitoring must be conducted by a suitably qualified person.

Step 5

The checklists will be based on the requirements of the EA and EMPR approved during the EIA process. Checklists may also be based on relevant laws and regulations. Monitoring of indicators can be carried out through making observations and taking samples at the monitoring points, at the predetermined intervals. The information will be gathered using the checklist mentioned above as well as any other suitable tools (e.g. bio-monitoring lists, on-line digital data, etc).

Step 6

The results of the monitoring are evaluated by comparing the information gathered with the targets that were originally identified. Evaluating monitoring results would involve a similar process to that for auditing, with the exception that certain specific monitoring tools will have their own methods of evaluation. The evaluation/interpretation of the monitoring data is considered the most crucial step of the monitoring process. Decisions on instituting corrective actions are based on the interpretation of the monitoring data.

Step 7

Monitoring results can be presented as a completed checklist, however it is advisable that trends analyses are compiled. Trend reports are an interpretation of the results of the monitoring reports, and are presented in the form of easily understood graphics.

Unlike audit results, it is not likely that monitoring results will be included in annual reports, though they will probably form part of project reports. The monitoring results must be stored in a suitable information system as they will be required for auditing purposes.

Step 8

The decision-making process will be less strategic and more focused on correcting environmental performance problems. In monitoring, the decision making process is driven by the need to resolve the non-compliance immediately.

Step 9

Instituting corrective action in the monitoring process is more immediate than the auditing process. All non-compliance issues will need to be corrected immediately in other words it may not be possible from a timing perspective to implement policy changes in order to improve monitoring results. The corrective action will be specific to each project and may need the input from all parties working on the project such as the planners, engineers, contractors, I&APs, etc.

3.4.3 Writing a Monitoring Report

The checklists and monitoring reports for environmental monitoring should be kept by the environmental manager and should be stored in a suitable information system. The checklists and reports must be available for use when conducting an audit of projects, programmes, policies etc. It is the responsibility of the person conducting the monitoring to ensure that the environmental monitoring report or checklist is accurately completed, the observations made during the monitoring are correct and a true reflection of the actual situation and that the interpretation of the data is logical and factual. The party responsible for performing the environmental must sign the monitoring report.

A monitoring report will not be a detailed report, as much of the monitoring information will be contained in the completed checklists. The monitoring report must begin with basic administrative information related to the monitoring. This includes the date/s that the monitoring was conducted, the type and objective of the monitoring, how the information on the checklist was obtained, who performed the monitoring, which checklists were used and any problems encountered during the monitoring process.

The monitoring report should then have a summary that identifies the key findings and recommendations of the monitoring, including a summary of compliance and non-compliance. A more detailed description of the important monitoring results should then be compiled. The report should also include a physical description of the site, the indicators (if relevant) and monitoring sites. The type of information that will be included in the report is dependent on the type of monitoring that was required for the specific purpose.

The report must clearly suggest recommendations or corrective actions that will assist in attaining compliance. Corrective actions will vary widely and should be decided upon by the person with the delegated powers to institute change.

It is crucial that the monitoring report includes all relevant supporting information, the checklists in particular must be completed in full. Diagrams, photographs, and other data may also form part of the report.

Recommendations to address areas of non-compliance or opportunities to reduce the risk of harm or detriment to the environment resulting from the activity, may also be included. The recommendations should be prioritized and dates for instituting corrective actions should be included where necessary.

3.4.4 Instituting Corrective Action, Continual Improvement and Preventative Measures

Corrective action for monitoring usually involves simple measures designed to stop the immediate problem for the short-term. Identifying the simple cause of a monitoring finding is fairly straightforward. The checklists should allow the monitor to highlight the areas where environmental problems have arisen. An examination of the facts should then enable the monitor to understand the problem and identify the cause. Corrective actions need to be devised which are specific to each problem. The assistance of a higher-level decision-maker may be useful in establishing appropriate corrective actions. A suitable deadline for the implementation of a corrective action should be determined. Further monitoring of this corrective action must be included in all future monitoring programmes.

The municipality and/or its appointed project engineer shall appoint an ECO to monitor compliance with the EMPR (above) - especially the following shall be monitored:

- Limiting of disturbance caused by construction activities (geographical area),
- Effective waste management,
- Minimisation of disturbance of biota,
- Legal compliance (including the stipulations of the Environmental Authorisation (Record of Decision).

The proponent shall conduct inspections of the construction site on a weekly basis. The following persons shall attend such inspections

- the site engineer,
- the contractor &
- the municipality.

The proponent shall document the findings of his monitoring actions.

The proponent shall keep a DOCUMENTED COMPLAINTS REGISTER. For the purposes of receiving complaints, the contact details of the proponent shall be clearly displayed at the main entrance to the site. The nature of complaints that are received shall be brought to the attention of LEDET and the contractor(s). The proponent shall give a suitable written response to complainants where required.

See enclosed pro-forma "COMPLAINTS REGISTER" – under Appendices (section 5 of this document).

The proponent contractor shall document "environmental incidents" on an "ENVIRONMENTAL INCIDENT REPORT SHEET" (EIRS) within 1 day (24 hours) from the time that the incident has occurred.

See enclosed pro-forma "ENVIRONMENTAL INCIDENT REPORT SHEET" (EIRS) – under Appendices (section 5 of this document).

In an instance where an "environmental incident" is recorded, the proponent shall take appropriate action to correct the "environmental incident". Such action shall be in accordance with the nature and scale of the recorded incident. Such corrective action shall be implemented as soon as possible after the occurrence of the incident.

"Corrective action" undertaken by the proponent shall also include the rehabilitation of secondary environmental disturbance/damage resulting from undertaking corrective action. The re-occurrence of an environmental incident shall be avoided through the implementing of suitable precautionary measures to prevent the recurrence of such.

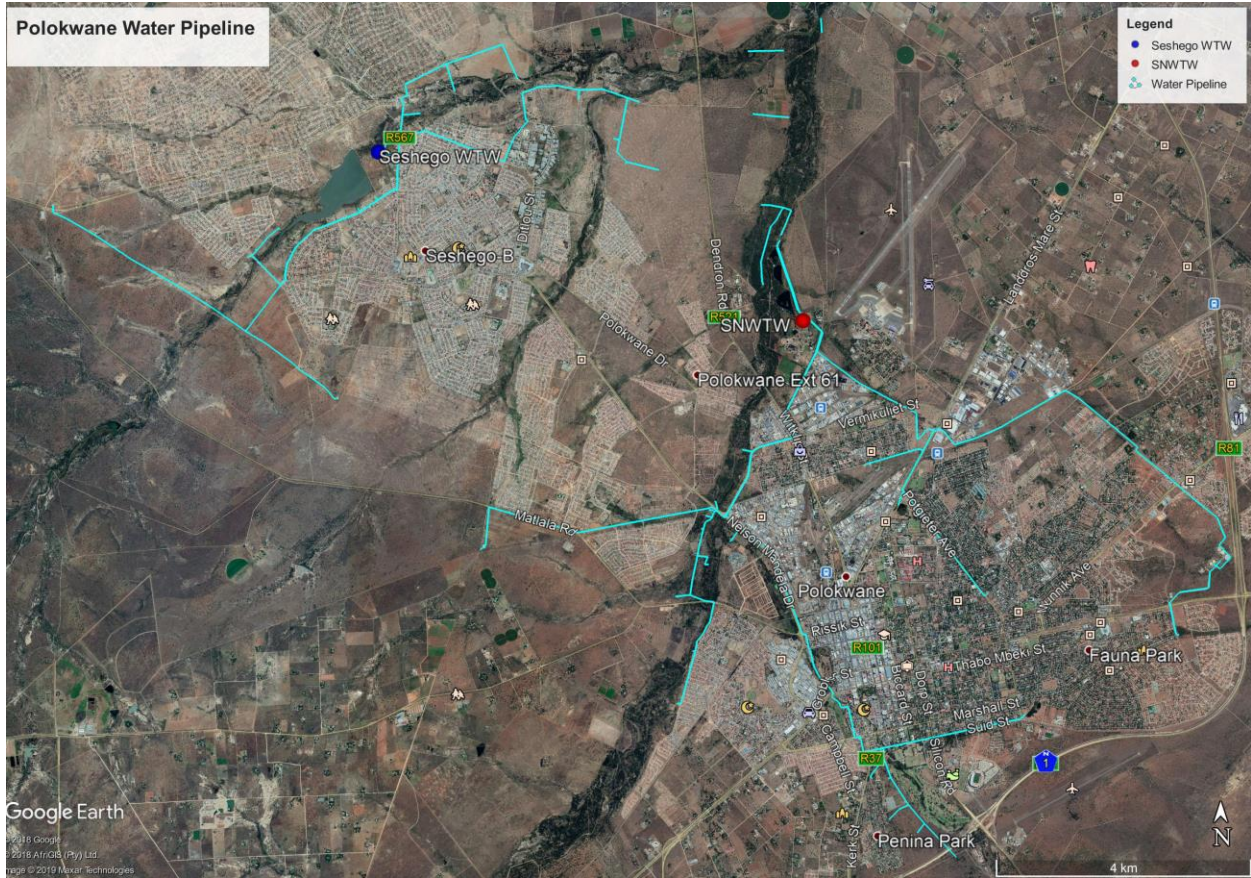
Contractors shall report environmental incidents to the proponent during the weekly site visits. A course of action shall then be decided upon jointly (as a precautionary measure to avoid the re-occurrence of these types of incidents).

3.5 CONCLUDING REMARK

This document should be viewed as a dynamic document and additions should be made to it as other impacts/issues are identified during the course of the project. Where additions or alterations are made, the parties responsible for decommissioning, maintenance etc. should be informed of this in writing – such parties should acknowledge receipt of such additions/amendments in writing.

In conclusion it can be stated that several negative and positive impacts/effects can potentially arise from the proposed development. These can however be mitigated through the implementation of a number of mitigation measures (as contained in this Environmental Management Programme).

4. MAP



5. APPENDICES

ENVIRONMENTAL INCIDENT REPORT SHEET	
NAME OF PROJECT:	
DATE AND TIME OF RECORDING:	
INCIDENT DESCRIPTION: (attach additional documentation e.g. photos or sketches where necessary)	
Incident number:	Date of incident: Time of incident:
1. Location of incident	
2. Volume of material involved (e.g. litres or m ³) or number of features damaged	
3. Cause(s) of incident	
DESCRIPTION OF CORRECTIVE & PREVENTIVE ACTIONS TAKEN:	
4. Materials and methods used for mitigation of the incident during and immediately after its Occurrence	
5. Disposal methods followed with Contaminated material (where Relevant)	
6. Steps taken to prevent a re-Occurrence of the incident	
7. Additional actions required by Environmental officer	
Signature of contractor's Representative:	I hereby certify that the above is a true and accurate account of the incident and the corrective and preventive actions taken _____ Signed Date
Signature of environmental officer:	I hereby certify that the above is a true and accurate account of the incident and the corrective and preventive actions taken _____ Signed Date

COMPLAINTS REGISTER	
NAME OF PROJECT:	
DATE AND TIME OF RECORDING:	
DESCRIPTION OF COMPLAINT RECEIVED: (attach additional information where necessary)	
Complaint number:	Date of complaint: Time of complaint:
Complaint received from:	Name: Address: Tel no.:
Cause(s) of complaint	
DESCRIPTION OF CORRECTIVE & PREVENTIVE ACTIONS TAKEN:	
Materials and methods used for mitigation to prevent a re-occurrence	
Signature of contractor's representative:	I hereby certify that the above is a true and accurate account of the complaint that was received and the corrective and preventive actions taken _____ Signed Date
Signature of environmental officer:	I hereby certify that the above is a true and accurate account of the complaint that was received and the corrective and preventive actions taken _____ Signed Date

REGISTER OF RESPONSE TO COMPLAINT(S)

NAME OF PROJECT:

DATE AND TIME OF RECORDING:

DESCRIPTION OF COMPLAINT RECEIVED: (attach additional information where necessary)

.....
.....
.....

Complaint number:

Complaint received from:

Name:

Address:

Tel no.:

DESCRIPTION OF RESPONSE PROVIDED TO THE COMPLAINANT (INCLUDING CORRECTIVE AND PREVENTIVE ACTION TAKEN):

.....
.....
.....

Signature of contractor's representative:

I hereby certify that the above is a true and accurate account of the complaint that was received and the response given

Signed:

Date:

Signature of environmental officer:

I hereby certify that the above is a true and accurate account of the complaint that was received and the response given

Signed:

Date:

6. REFERENCES

Department of Water Affairs and Forestry, 2005 Environmental Monitoring and Auditing Protocol. Integrated Environmental Management Sub-Series No.1.7 . Second Edition. Pretoria.

Department of Water Affairs and Forestry, February 2005 Environmental Monitoring and Auditing Guideline. Integrated Environmental Management Sub-Series No. IEMS 1.7. Third Edition. Pretoria. Appendix J: Environmental Best Practice Monitoring Report: Construction