

Chapter 1: Introduction to the Environmental Management Program (EMPr)

Approach to environmental management in construction phase and operational phases

This plan covers both construction and operational phases of the project. Operational phase activities are limited to maintenance of the Arterial and Link Road; including stormwater infrastructure, lighting, signage, pedestrian and cycle walkways and waste bins; and maintaining planted verges.

A number of steps are essential to ensure that environmental damage will be minimised or eliminated in construction and operational phases:

1. Potential impacts must be identified and their significance assessed – this has been done in the Environmental Impact Report (EIR)
2. Suitable mitigation measures need to be defined – these are listed in the EIR and are re-iterated in this EMPr
3. A system to ensure that the necessary mitigation is being implemented must be established –this EMPr provides a framework for an environmental management system, where objectives and targets are set for various construction activities and their related impacts. Roles and responsibilities of the various role players responsible for implementing the EMPr (and mitigation measures) are defined
4. The effectiveness of the management must be monitored – addressed in this EMPr
5. The Project Manager, Resident Engineer, Environmental Officer (EO), Environmental Control Officer (ECO) and the representatives of the developer must be in a position to verify the work undertaken and to monitor the environmental management process in construction phase
6. The Nelson Mandela Bay Municipality (NMBM) will be responsible for maintenance activities in operational phase

The purpose of this EMPr is to describe:

- ❖ How adverse environmental impacts should be managed
- ❖ How environmental damage or degradation will be mitigated
- ❖ How site rehabilitation will be undertaken and
- ❖ What monitoring is necessary to ensure that the above measures are successful

The EMPr should be viewed as a dynamic document, which may require updating and / or revision as the project develops.

The successful implementation of this plan is dependent on it forming part of the project's management system. Without regular checks on performance and corrections of deviations from the environmental objectives, procedures and targets; the plan will fall into disuse and become ineffective. The EMPr therefore includes various elements of an Environmental Management System (EMS) such as objectives and targets, the allocation of responsibilities, checking of corrective action, regular audits, and management review of the system.

For Whom is the EMPr Intended?

The EMPr is a management tool and will be used primarily by the EO, ECO, Project Manager, Resident Engineer and the contractors responsible for the on-site work in construction phase; and the NMBM during operational phase. The contents of the EMPr should be communicated to all construction staff through an environmental awareness training system. All construction staff, contractors and sub-contractors must be alerted to the importance of implementing the requirements of the EMPr in their day-to-day activities, and a penalties/incentive system must be developed to promote its implementation.

It is recommended that this EMPr should be available to the public upon request.

Structure of this Environmental Management Program

Chapter 1 introduces the scope of the EMPr and explains the purpose of the plan.

Chapter 2 presents some basic management prescriptions.

Chapter 3 briefly discusses environmental policy. It presents a suggested organisational structure for the project to ensure that responsibilities are allocated and that there is adequate control over the work.

Chapter 4 recommends general environmental management requirements - with specific objectives and targets - which apply to all stages and elements of the construction and rehabilitation process.

Chapter 5 presents elements of the Environmental Management System designed to facilitate the implementation, management and regular audit of the EMPr.

A Glossary of Terms is presented in **Chapter 6**.

Chapter 2: Anticipated activities and general environmental management prescriptions

Construction Activities

The following construction activities will be undertaken and have relevance to management recommendations to be covered in this EMP to avoid / mitigate environmental impacts:

- ❖ Site demarcation
- ❖ Establishment of a site camp and office
- ❖ Importing, use, and storage of materials, vehicles and equipment
- ❖ Site clearing and grubbing
- ❖ Excavation
- ❖ Trenching
- ❖ Cutting
- ❖ Concrete pouring
- ❖ Filling and compaction
- ❖ Levelling
- ❖ Importing of material for road works and surfacing
- ❖ Road layerworks
- ❖ Waste storage and removal
- ❖ Temporary storage of spoil material, and removal
- ❖ Site tidying and rehabilitation

Operational Activities

- ❖ Maintenance of the Arterial and Link Road, including lighting, signage, pedestrian and cycle ways
- ❖ Maintenance of stormwater infrastructure, and cleaning of litter traps
- ❖ Cleaning waste from bins
- ❖ Maintenance of planted verges

Environmental Planning

Construction Phase

Environmental Commitment

All persons involved with construction must be made aware of the developer's environmental goals and policy and the contents of this EMPr, and should be encouraged to develop a commitment to comply with these.

Site and Activities Planning

Careful consideration to the layout of a construction site and construction activities prior to any construction commencing will greatly reduce the effort required to meet the environmental and safety requirements discussed in this EMPr. Comprehensive site planning is essential to the successful and cost effective rehabilitation of all construction sites.

Prior to construction commencing the Resident Engineer in consultation with the Environmental Control Officer (ECO) and other project staff must compile a "detailed" site plan. Items to be covered in the site plan are listed in Table 1.

Rehabilitation of the construction site is an integral part of the project, and the 'construction planning' team should plan for the final rehabilitation and restoration of the site before construction starts. For final rehabilitation and restoration of the site to be successful, it is essential that the future rehabilitation requirements be considered in the planning stages and that operators plan for progressive rehabilitation while operations are ongoing.

Once the final details of a site have been determined, the Resident Engineer or his representative and / or the ECO should photograph the proposed construction site and surrounding areas. This photographic record will be invaluable in their rehabilitation work.

Table 1: Items to be covered in site planning

Issue	Nature / Description
Sequence of events	Briefly describe the sequence of events that will take place from the time that the contractor moves onto site to the time when the site is handed over to the developer
Site camp and office	Location of a site camp and office. Security required for site camp
Site demarcation	Mark out work area. Fencing
Health and safety	Potential risks and hazards, and precautions that will be taken Staff rest and eating area, hazardous materials storage, first aid kit, fuel store, security issues, fire control Safety of surrounding residents, pedestrians, cyclists, workers, motorists etc. PPE for construction staff Barricading of trenches
On site toilets	How many required for the particular development? How long are the toilets required on site? Location of toilets Frequency of emptying of toilets and where waste will be removed to Contract signed with registered service provider to empty toilets
Workforce	Number of on-site workers Training of workforce in terms of environmental awareness and daily work practice in line with the requirements of the EMPr and method statements Management of workforce, particularly sub-contractors
Transport and traffic	Transport required for site workers Site access, turning circles Routes to be used by construction vehicles Demarcate location of access roads, traffic turning circle and parking areas
Construction vehicles and equipment	Type and numbers of vehicles and equipment required for construction. Storage areas. Maintenance and re-fuelling. Daily checks.

Issue	Nature / Description
Topsoil	Approximation of quantity to be excavated Where to be stockpiled How long to be stockpiled Area required for stockpile Management of stockpile
Site clearing and earthworks	Permits required for removal of threatened/protected flora and fauna Search and rescue of flora and fauna prior to construction commencing Nursery area for plants to be used in rehabilitation (if required) Volume of material to be excavated Where stocks to be kept on site Temporary spoil material storage area How long to be kept on site Where, when and how to be disposed of (spoil material)
Drinking water	Quantity required Source of water Location of potable water on site
Cooking/Eating/Rest areas	Area required Equipment required Location
Existing structures/infrastructure	Indication of location of any structures that need to be removed and/or protected Relocation of persons living in the road corridor completed prior to construction commencing
Life of project	Working hours Time frame Phasing
Stormwater management	A stormwater plan must be developed that considers: <ol style="list-style-type: none"> 1. Preventing contamination of stormwater 2. Preventing potentially contaminated stormwater from leaving the site and entering drainage areas and wetlands 3. Stormwater flow control and erosion prevention 4. Litter control and maintenance of existing stormwater infrastructure
Environmentally sensitive areas and possible environmental risks associated with construction activities	A plan of environmentally sensitive areas/aspects must be drawn up and made available to contractors. A training program on possible environmental risks that may result from construction activities and how to deal with these (including a reporting structure) must be made available prior to construction commencing. ECO to assist
Waste management	Litter drums - number, type, size, location Waste skips Closest registered waste disposal site Waste management plan Recycling / material re-use options Dealing with hazardous wastes – storage, clean-up Wash-bay areas for equipment Spills – spill kit, response, clean-up, reporting
Air quality	Management of dust Water truck on site Source of water for dust control Possible emissions sources from equipment and vehicles, daily inspections

Issue	Nature / Description
Pollution prevention and control	Possible sources of pollution and polluting incidents (e.g. concrete pouring and transfer, fuel storage, oil leaks from vehicles and equipment, litter, road surfacing etc.) Prevention at source through good work practice Control mechanisms and response to polluting incidents – clean-up, reporting, equipment and materials needed, waste management, training Penalties if required
Alien vegetation/weed management	Possible types of alien vegetation / weeds to be expected, monitoring, eradication plan

Minimising Disturbance

Environmental impacts, such as erosion caused by storm water run-off and alien vegetation invasion, increase proportionally with the increasing area of disturbance. It is very important that the total disturbed area be minimised.

Minimisation of the total disturbed area is the best method of reducing final rehabilitation costs and environmental damage. Limit the disturbance to the minimum that is required for efficient operations. Surrounding vegetation is a valuable resource that can be needlessly destroyed by brief activities with heavy machinery and indiscriminate use of the area by humans. All site workers must be informed of the limits of the work area and should be instructed not to utilise areas outside of the defined activity zone. As far as practically possible, the project must be labour intensive, and the use of heavy machinery avoided.

Demarcation of the Limits of the Site

Prior to any construction beginning, the work area must be clearly demarcated by means of orange snow-netting or similar suitable material. Activities may only take place within the demarcated zone. Where possible, vegetation occurring inside the demarcated activity zone should be cut to ground level, leaving the roots and soil undisturbed rather than removed. This will assist in preventing soil erosion if any heavy rains fall during the construction period.

All material and machinery required for construction should be located within the demarcated activity zone. No activities or dumping may take place outside of the demarcated activity zone.

The following areas are important no-go areas:

- ❖ Wetlands and their buffers
- ❖ Drainage areas and their buffers (apart from areas where the road has to cross a watercourse)
- ❖ The CBA that runs in a north-south direction across the Bloemendal Arterial

Construction Machinery on Site

Generators and fuel supply needed for equipment during the construction phase must be placed on trays, which rest on clean river sand. This is to collect any leaks, and prevent oil or fuel spills. The river sand (clean or contaminated) must be removed from the site once construction has been completed. All contaminated material must be disposed of at a registered hazardous waste disposal facility. Construction machinery that is parked on site overnight must have drip trays under areas where fuel or oil could leak from.

Materials Used During Construction

No cement or concrete may be mixed on the soil surface. Cement mixers must be placed on large trays to prevent accidental spills onto the soil surface. Where cement or concrete is mixed on the soil, contaminated soils should be removed and disposed of at a registered waste disposal site.

Fill material will need to be brought to site as in situ material is not suitable for road works. Imported material must be monitored for alien vegetation. Excess soil and stone removed during excavation should be used in site levelling as far as possible.

The Resident Engineer must ensure that the contractors obtain material safety data sheets for all materials used on site. Where applicable, all site workers must be informed of the hazardous nature of the materials being used.

Rehabilitation

The term 'rehabilitation' is used to encompass all of those measures, which seek to repair disturbed or degraded land, and to return such land to a stable and non-polluting state, which is suitable for the proposed future use of the land. The main aims of rehabilitation work are to:

- ❖ Achieve long-term stabilisation of all disturbed areas to minimise ongoing erosion;
- ❖ Re-vegetate all disturbed areas with suitable plant species to promote biodiversity conservation;
- ❖ *Rehabilitate wetland areas that have already been disturbed, as per recommendations of the aquatic specialist report. This will be a broader responsibility of developers in the greater area who have commenced with construction activities in wetlands and their buffers, and drainage areas.*
- ❖ Minimise visual impact of disturbed areas; and
- ❖ Ensure that disturbed areas are safe for future uses.

Site Clean Up

The first step in the rehabilitation operation is a general clean-up of the total area around the works. Site clean up to be undertaken after cessation of the construction activities includes:

- ❖ Removal and appropriate disposal of all waste materials including hazardous materials, spoil material, rubble etc.;
- ❖ Dismantling and removal of markers/mesh used for demarcation;
- ❖ Break up and removal of concrete mix residues;
- ❖ Rehabilitation of surplus tracks and turning areas, camp sites and stockpiles,
- ❖ Identification of any hazardous or contaminated materials, and their removal.
- ❖ Removal of any remaining alien invasive vegetation

Site Preparation

Proper site preparation is vital to the successful stabilisation and re-vegetation of any disturbed site. The largest proportion of the cost of rehabilitation is usually incurred here. Cutting corners in this area will jeopardise the success of the entire rehabilitation program.

The first step in the site preparation process involves the reshaping of the area. The final land use of the site will determine the final landform. Generally, the site should be shaped so as to blend in with the surrounding landscape. Knobs and stockpiles should be levelled and waste rock / overburden pushed into hollows. The site should be left in a stable state that blends in with the surrounding area. On erodible sites, it is most important that slopes be reduced during site preparation. Steep slopes of greater than about 3 to 1 (20% or 36%) will generally continue to erode unless expensive stabilisation measures such as pegging out of geotextiles or mulch mats to break up the slope are undertaken. Areas of high disturbance and with a high visual impact may require special measures to rapidly ameliorate the impact. Topsoil should be re-spread uniformly over the area at a suitable depth to support re-vegetation. Remember that a thin layer of topsoil is far better than none at all. Re-spread soil should be left with a rough surface with many suitable locations for lodgement and germination of seeds. Smooth surfaces should be ripped, or manually cultivated to improve the 'roughness' of the seedbed and provide suitable sites for lodgement and germination of seeds. Avoid spreading soil when saturated or sticky, as compaction and other damage to the soil structure will occur. Where topsoil is not available on site, alternatives must be sought - these may include subsoil or imported topsoils. Extreme care should be taken when importing topsoils because they often contain seeds of vigorous weeds. All compacted areas

should be ripped along the contour. This may be carried out before or after spreading topsoil. Ripping will promote water infiltration and root penetration. Ripping should be carried out when the soil is relatively dry to increase soil break-up. Ripping after soil spreading will also help to 'key' in the soil to the underlying material, and it provides a rough surface for seed application. Where soils have been spread some time before seeding, settling and formation of a hard crust may have occurred. If this is the case, the area should be ripped.

Progressive Rehabilitation

Progressive rehabilitation refers to the rehabilitation of areas that are no longer required for the construction activities while the other operations continue. Progressive rehabilitation is an important component of any development and should be implemented where feasible.

Vegetation Clearing and Topsoil Stripping

Topsoil is usually the darker, upper soil layer. Though only 10 - 30 cm deep it contains nutrients, minerals, seed, and organic matter, which helps to bind it all together. The regenerative capacity of the natural soil should be protected during the construction activities.

Vegetation being cleared may contain small amounts of seed, or provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation. Smaller sized vegetative material may provide useful mulch for later use in erosion control works, or else it should be combined with the topsoil. Topsoil is a very important requirement for low cost re-vegetation of disturbed sites. Topsoil from all working areas and access tracks should be stripped carefully and stockpiled for later use, or used immediately to rehabilitate already disturbed areas. Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to re-vegetate more rapidly than topsoil that has been in stockpile for long periods. Do not strip topsoil when saturated, as this will exacerbate the damage to the soil structure. If topsoil must be stockpiled, remember that it deteriorates in quality while stockpiled.

Control of Noxious Weeds and Pest Plants

Land clearing and disturbance provides opportunity for the invasion of exotic plants. Weed invasion can be minimised by taking measures to ensure that construction operations do not introduce exotic species to an area, and also by adopting measures to manage weed infestations at the site until such time as native species have become established after rehabilitation.

Drainage and Erosion Control

Sediment derived from erosion by water, and other water borne contaminants such as diesel and oil, are often sources of pollution arising from construction activities. If environmental management is inadequate, water quality may be affected far beyond the boundary of the project.

Wherever possible, drainage works should seek to mimic natural drainage patterns and utilise natural drainage lines with retained vegetation. A cut-off drain or diversion banks above all excavation/cuts will help prevent water from entering the site and adding to erosion problems. Cut-off drains should discharge into vegetated natural drainage lines or via a level sill that distributes run-off across a stable vegetated area. Contour drains can also be used to capture and slow down water that would otherwise gather momentum as it travels down the slope. Rate of run-off increases dramatically following vegetation removal; hence the total area exposed should be kept to a minimum. Access tracks often have a major impact on water quality. Gradients should be controlled, drainage structures well maintained, and regular cross drains or culverts installed.

Erosion Prevention

Erosion will continue long after construction activities have ceased unless preventative measures are implemented. Poor drainage management can lead to damage or destruction of the rehabilitation investment. The best erosion prevention at a site is the establishment of vegetation. However, while vegetation is becoming established, it may be necessary to employ other erosion prevention techniques.

It is generally wise to retain any existing drainage controls, such as contour banks, rock filters and cut-off drains, upslope of the area being rehabilitated, to slow down surface run-off. A rough surface will capture more water and allow rainfall to infiltrate rather than flow directly downhill. Artificial structures should be removed once the site is fully rehabilitated.

Re-vegetation

Establishment of a self-sustaining cover of vegetation is the best low maintenance stabiliser of disturbed sites in the long term. Re-vegetation also minimises the impact of visual intrusion. Generally, the vegetation type, which existed before the disturbance, or a similar vegetation type will be most successful afterwards, following an initial re-establishment period. Re-vegetation will be considerably easier to achieve where site preparation has been done well.

The objectives of re-vegetation should be to re-establish a native vegetation cover which is similar in species composition to that which existed before the disturbance; and to prevent erosion on the site, and manage adverse visual impacts from critical viewpoints.

Waste Disposal and Storage of Chemicals

Construction works can generate a substantial amount of litter and rubbish. All rubbish, litter, equipment, temporary structures, and waste material must be removed on a progressive basis from the site and recycled wherever possible, or disposed of at a registered waste disposal site. The contractor should sign up with the NMBM's Waste Exchange Program to facilitate re-use of materials. Hazardous materials must only be disposed of at an approved hazardous waste disposal facility.

Health and Safety Matters

Adequate chemical toilet facilities must be erected and maintained in good order on the site for the duration of the construction phase. Toilets should be removed from site when construction is completed. Waste must be disposed of at a registered waste site.

Adequate clean drinking water must be available to construction staff at all times during the construction period.

Air Quality

As vegetation is cleared and soils are disturbed, the potential for dust generation increases. Air quality may also be affected by transporting of fine materials on the back of open trucks, and emissions from poorly maintained equipment. Provision must be made for dust control, for example wetting down of soils and deciding when winds are too strong for work to continue. Vehicles transporting fine materials must be equipped with a tarp. Equipment should be inspected daily to determine if it is in sound working order to prevent emissions and leaks.

Operational Phase

Planning for operational phase activities includes:

- ❖ Developing a maintenance schedule for the NMBM to implement for the Arterial and Link Road.
- ❖ Developing a cleaning schedule for litter traps in stormwater infrastructure
- ❖ Developing a cleaning schedule for waste bins along pedestrian and cycle ways
- ❖ Sourcing plant material (can use vegetation removed from the road corridor in construction phase), and preparing beds/planters in road verges for planting
- ❖ Assigning sufficient budget and staff to implement maintenance and cleaning.

Chapter 3: Organisational Requirements

Introduction

The developer and their appointed project managers must make the relevant parties aware of their environmental objectives and policy.

Background to Environmental Policy

An environmental policy is a statement of the environmental values of an organisation. It conveys these environmental values to employees, demonstrates to stakeholders the importance that senior management attaches to environmental protection and management, and provides a guiding framework for conducting the organisation's business in an environmentally compatible manner.

The philosophy behind the EMPr is for it to become an effective means of managing environmental performance by:

- ❖ Enabling the identification of critical environmental issues;
- ❖ Developing action plans and setting targets;
- ❖ Ensuring environmental performance;
- ❖ Raising environmental awareness amongst management, staff and the community which it serves; and,
- ❖ Providing appropriate training.

The purpose of the EMPr is to translate environmental policy into practice by putting in place workable systems, structures and tools to achieve integrated and consistent environmental management of all environmental initiatives.

This EMPr suggests certain detailed objectives, which it believes, are applicable to construction and operational activities. It is important that the developer and their project managers review these detailed policies and if in agreement, adopt them as firm policy.

Nelson Mandela Bay (Suggested)

We aim to conduct all our business activities and operations in an environmentally responsible manner.

As a major stakeholder in the sustainable and responsible development field in the Eastern Cape we are committed to:

- ❖ Establishing and maintaining compliance with all applicable legislation, regulatory requirements and standards for protection of the environment as a minimum condition, and to go beyond those requirements wherever practicable.
- ❖ Educating, informing and motivating our employees and contractors to ensure our activities and operations are conducted in an environmentally responsible manner through development and implementation of a Corporate Environmental Training Program and the provision of advice as required.
- ❖ Actively communicate with employees, other state departments, and the public with regard to environmental management.
- ❖ Prevent pollution, ensure efficient use of resources and minimise waste through promotion and implementation of cleaner operation principles and technology.
- ❖ Research, support and implement new technology and operational practices which improve environmental performance where practicable.

- ❖ Pursue continuous improvement in environmental performance through development and implementation of objectives and targets, reviewing Policy and Procedures and regularly monitoring and auditing our performance.
- ❖ Conduct periodic reviews of the effectiveness of this Environmental Policy, update this Policy when necessary and re-issue it to employees and the public as appropriate.

Organisational Overview

All “managers” involved in construction should be obliged to familiarise themselves with the developer’s stated environmental policies. Managers should be familiar with the requirements of the EMPr and should execute all construction, decommissioning and maintenance activities in an environmentally responsible manner.

This overview offers a perspective of the proposed organisation of the EMPr and the recommended responsibilities of key members of the project team, as represented in the organogram.

Ultimate responsibility and public accountability for the EMPr and general environmental management during construction phase resides with the developer (i.e. the NMBM).

The contractors are responsible for implementing and managing the EMPr. It is recommended that the contractors appoint an on-site environmental officer (EO) who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis. The contractors report to the Resident Engineer or his representative regarding compliance with the conditions as stipulated in the EMPr. The Resident Engineer or his representative works through the site EO to assist with day-to-day environmental management.

An independent and external Environmental Control Officer is appointed by the developer to assist and advise on the implementation of the EMPr and do monthly audits to monitor compliance with the environmental authorisation issued for the project by DEDEAT, the EMPr and method statements, and any other relevant legislation and policies. Where procedures in the EMPr and methods delineated in the Method Statements are persistently transgressed and appropriate corrective action is not implemented, the ECO through the Resident Engineer or his representative may order the suspension of related activities or impose a fine on the transgressor. A penalties system must be devised at the time of signing contracts so that all parties are aware of the requirements, and potential repercussions.

Regular meetings should be held to ensure that the EMPr is effectively implemented.

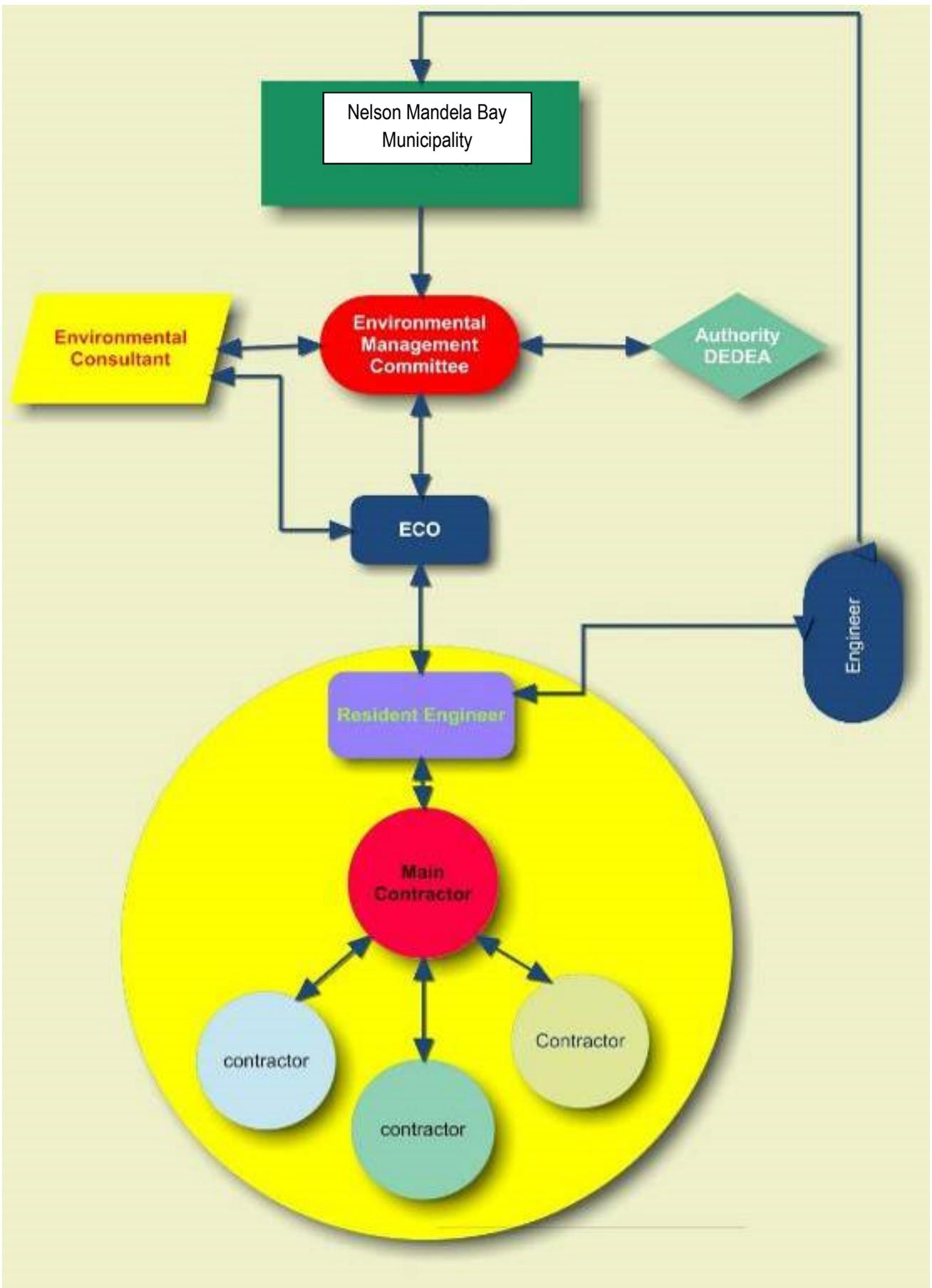


Figure 2: A Possible Organisational Structure for the Environmental Management of the Construction Phase of the Bloemendal Arterial and Link Road.

Roles and Responsibilities for the Implementation of the Environmental Management Program

This section defines the roles of the key parties involved in the implementation of the EMPr and mitigation measures suggested in the Environmental Impact Report relevant to the construction phase of the development.

The Developer

The developer has the overall accountability and responsibility for environmental management during the design, construction and operational phases of the development. Further it is their responsibility to ensure that the conditions of the Environmental Authorisation and mitigation measures suggested in the Environmental Impact Report (EIR) are communicated to, implemented and complied with by the project managers, contractors and sub-contractors.

While it is the responsibility of the contractors and the sub-contractors to prepare and implement the detailed Method Statements, the developer will remain accountable for their implementation.

The developer will be responsible for liaising with the relevant authorities with respect to the implementation of the Environmental Authorisation and the EMPr.

With respect to the EMPr, the developer is responsible for:

- ❖ Liaising with the project engineer, site manager, contractors and builders, to ensure that all components of the development are designed to meet all the listed environmental conditions as well as all of the legal requirements.
- ❖ Reviewing the Method Statements prepared by project engineers, the contractors and sub-contractors for specific activities relating to the construction phase.
- ❖ Reviewing and approving management plans prepared by the project engineers, contractors and sub-contractors.
 - Reviewing and approving any environmental monitoring programs that are recommended by ECO, the EO, or the authorities.
 - Advising on actions to be taken in the event of incidents or public complaints.
 - Providing the results of environmental reports to the relevant authority
 - Ensuring that the required audits are undertaken on a timely basis and that the results of the audits are communicated to all operation personnel.

Authorities

The authorities are responsible for the timely processing and issuing of the necessary permits and authorisations for the development. The authorities will ensure that the developer complies with the terms that are stipulated within the Environmental Authorisation. Where necessary, the authorities will assist the developer in understanding and meeting the specified requirements.

The authorities may perform random controls to ensure compliance with the conditions. In such case, the developer will assist the authorities in every possible way to facilitate control. In case of long-term non-compliance, the developer will be required to provide an action plan with corrective measures for approval by the authorities.

Responsibilities: Resident Engineer

All obligations relevant to the developer concerning the implementation of the EMPr will apply to the Resident Engineer or his representative, contractors and sub-contractors associated with the construction phase of the development. The developer will inform the Resident Engineer or his representative of these obligations, as well as of the Method Statements required in terms of these obligations, and will control their implementation. The Resident Engineer or his

representative is to convey the requirements of the EMPr to the contractors and their sub-contractors; and ensure that they comply with these obligations.

It is the responsibility of the project engineers, contractors and sub-contractors to prepare and implement Method Statements which detail the means they will employ in order to meet the objectives set in the EMPr.

The contractors and sub-contractors will be required, where specified, to provide Method Statements to the Resident Engineer or his representative setting out in detail how the management actions will be implemented to ensure that the environmental management objectives will be achieved. The method statements of different sub-contractors will be consolidated by the Resident Engineer or his representative into a Management Plan for a particular component of the EMPr (e.g. clearing and grubbing). These Management Plans must be reviewed and approved by the developer prior to the commencement of the relevant construction activity.

The Resident Engineer or his representative working in close co-operation with the Site Environmental Control Officer ensures that the EMPr is implemented. The Resident Engineer or his representative is the direct link between the Site Environmental Control Officer and the Contractors and sub-contractors. Specific responsibilities include:

- ❖ Distribution of copies of the EMPr to the project team
- ❖ Advising the developer on the appointment of any specialist if required
- ❖ Attending Project Progress Meetings, where the performance of the EMPr is discussed and / or reviewed.
- ❖ Commissioning monitoring programs recommended by the Site Environmental Control Officer
- ❖ Ensuring that measures are taken to address any problems in the implementation of the EMPr
- ❖ Briefing the contractors regarding their EMPr responsibilities and ensure that they implement the conditions of the plan
- ❖ Formalising systems and delegating authority to ensure that the EMPr is effectively implemented
- ❖ Regular site inspections and monitoring to ensure compliance with the prescribed procedures in the EMPr
- ❖ Devising a Corrective Action Procedure for implementing corrective and preventive action
- ❖ Regular consultation with the Site Environmental Officer, as appropriate
- ❖ Facilitating the implementation of a general and specific environmental awareness training program
- ❖ Devising a system to evaluate the training program regularly and recommend changes as required
- ❖ The creation, in consultation with the Site Environmental Officer, of a Method Statement pro-forma, for distribution to the appropriate contractors and their sub-contractors
- ❖ The examination, revision and approval, of contractors' Method Statements
- ❖ Keeping records of waste disposal, audits, inspections, monitoring and corrective actions
- ❖ Ensuring that copies of the EMPr are available to all contractors and sub-contractors
- ❖ Identification of any new significant environmental impacts and their associated aspects, and the necessary environmental management requirements to manage them

- ❖ Organising regular audits on the implementation of the EMPr

Responsibilities: Contractors and Sub-Contractors

The Contractor/s and sub-contractors have final responsibility and are accountable to the developer for the effective implementation and monitoring of the EMPr.

The contractor and sub-contractors are responsible to the Resident Engineer or his representative for the effective implementation of the EMPr within their respective line functions. Specific responsibilities include:

- ❖ The full implementation of all of the requirements of the EMPr in terms of the approved method statements.
- ❖ Ensuring that all sub-contractors are familiar with and implement the EMPr
- ❖ Identifying procedures applicable to the activities they perform and / or control
- ❖ Identifying, in consultation with the Resident Engineer or his representative which sub-contractors are responsible for compiling which method statements
- ❖ Compiling method statements to meet the procedures and targets set out in the EMPr
- ❖ Submitting method statements to the Resident Engineer or his representative for approval
- ❖ Devising a system for monitoring compliance with method statements and procedures
- ❖ Identifying environmental training needs and implementing the environmental awareness training program commissioned by the Resident Engineer or his representative
- ❖ Implementing corrective and preventive actions recommended by the Resident Engineer or his representative
- ❖ Reviewing of the EMPr implementation and effectiveness at site meetings with the Resident Engineer or his representative and the Site Environmental Officer
- ❖ Ensuring regular internal auditing of the implementation of the EMPr.
- ❖ Maintaining and submitting records of waste disposal activities and corrective actions taken to rectify environmental problems on site.
- ❖ Attending Environmental Management Program monitoring meetings with the Resident Engineer or his representative
- ❖ Keeping a complaints register on site.

Responsibilities: Site Environmental Officer

A Site Environmental Officer must be appointed by the Project Manager to advise and assist the Resident Engineer or his representative and project team where necessary and to monitor the implementation of the EMPr. The Site Environmental Officer reports to the developer through the Resident Engineer or his representative and/or depending on circumstances to the Independent Environmental Control Officer appointed by the developer.

His/Her duties include:

- ❖ To raise the awareness of the contractor and sub-contractors and their staff to the environmental sensitivity of the project area and to foster an appropriate environmental attitude during the contract period.

- ❖ Supporting and advising the Resident Engineer or his representative, especially with regards to reviewing Method Statements, auditing, monitoring and corrective and preventive action
- ❖ Accompanying the Resident Engineer or his representative on site inspections at a frequency determined by the developer, the Resident Engineer or his representative and the ECO
- ❖ Recommending environmentally appropriate solutions to environmental problems
- ❖ Recommending additional environmental management measures as appropriate
- ❖ Attending project progress meetings, as necessary or on a basis determined by the developer and the Resident Engineer or his representative

Responsibilities: External Environmental Control Officer

An external environmental control officer must be appointed by the developer to assist with monitoring/auditing compliance with the EMPr, method statements, and other relevant legislation and policy for the duration of construction. The external ECO will do monthly audits, which must be submitted to the authorities, and will be available to the construction team for assistance/advice at any stage when required. Specific duties include:

- ❖ Review environmental authorisation and other relevant documents to facilitate compliance with conditions prior to construction commencing
- ❖ Assisting in site planning – e.g. site camp position, site demarcation, waste management, pollution control measures, rehabilitation planning
- ❖ Assist with obtaining any additional permits prior to construction or a specific activity commencing
- ❖ Oversee vegetation clearing and management for future use in landscaping and rehabilitation
- ❖ Review of method statements
- ❖ Review of environmental awareness training material
- ❖ Monthly audits
- ❖ Attend monthly progress meetings
- ❖ Respond to repetitive non-conformances and/or incidents, and provide advice on corrective action and procedures
- ❖ Oversee rehabilitation and landscaping
- ❖ Assist developer where required in liaising with authorities

Method Statements

The appropriate contractors must submit Method Statements to the Resident Engineer or his representative, Site Environmental Officer, and external ECO/auditor outlining proposed construction activities, phasing and procedures and methods to comply with the targets stipulated in this EMPr. Method Statements should, where applicable, include drawings and plans with sufficient detail to assess the potential impact of the facility/activity and to determine the degree of safeguarding provided against possible risks.

Method Statements indicate how the procedures will be applied to meet the relevant targets and are central to the proper implementation of the EMPr. It is anticipated that in addition to assessing the systems and performance of the EMPr, the Site Environmental Officer and external ECO will scrutinise the formulation of, and adherence to "Method Statements" in some detail.

Method Statements must be submitted and approved before any work on the project is undertaken. The various method statements must be approved by the Resident Engineer or his representative (in consultation with the Site Environmental Officer and external ECO). The Resident Engineer or his representative must keep copies of these Method Statements and letters of approval (including conditions attached) in an Environmental File.

The Resident Engineer or his representative (and the Site Environmental Officer and external ECO) must approve any deviations from the approved Method Statements. All amendments must be in writing and must be submitted to the Resident Engineer or his representative.

The following method statements (at a minimum) should be submitted:

- ❖ Clearing
- ❖ Earthworks
- ❖ Stockpiling of soils and other materials
- ❖ Solid waste management: expected solid waste types, quantities, methods and frequency of collection and disposal as well as location of disposal sites
- ❖ Stormwater management: methods to be put in place to control runoff to prevent erosion and / ponding on site. Also address possible contamination of stormwater from site activities, and methods to minimise, control and dispose of contaminated water
- ❖ Contractors SHE officer: the name and letter of appointment of the contractors SHE officer must be given to the resident engineer. The terms of reference of the SHE officer must be specified, and other information such as times on site, role and responsibility, interactions with resident engineer and ECO etc. must be included
- ❖ Site planning: the location, layout and method of establishment of the site camp, work area, stockpiles, equipment etc. (as specified in Table 1)
- ❖ Emergency procedures: procedures to deal with fire, leaks and spills. Include details of risk reduction measures to be implemented including firefighting equipment, fire prevention procedures and spill kits.
- ❖ Importing of material: detail the source and nature of all imported materials, anticipated quantities, stockpile areas, vehicle routes
- ❖ Hazardous substances: details of any hazardous substances to be used on site, including storage, transport, handling and disposal procedures.
- ❖ Control of alien vegetation that establishes as a result of disturbance during construction: identification, removal
- ❖ Cement and concrete batching/mixing: location, layout and preparation of cement and concrete batching areas. Include methods for the mixing of materials, and how runoff will be contained. Washing of equipment used in cement mixing

- ❖ Fuel storage and use: design, location and construction of fuel storage areas. Filling and dispensing from storage areas
- ❖ Workshop and drip trays: location, layout and design of areas, including pollution control in the workshop and the management of drip trays under the plant
- ❖ Air quality: details on methods that will be used to prevent and control dust on site and from vehicles transporting fine materials, and prevent emissions from equipment and vehicles
- ❖ Environmental awareness training: number, dates, trainer, logistics for the initial awareness courses for the contractors employees and management staff
- ❖ Access routes: details, including a drawing, of where access routes will be and how they will be managed
- ❖ Rehabilitation: vegetation storage, site cleaning, site preparation, topsoil application, planting, stabilisation measures, maintenance

No work shall commence until method statements have been approved by the resident engineer and ECO. Ten working days should be allowed for the review and approval of method statements. Approved method statements must be available on site and must be communicated to all relevant parties.

Meetings

It is anticipated that progress meetings, attended by the Resident Engineer or his/her representative and other members of the project team, will be held on a regular basis. It is recommended that a minimum of one meeting every month be held where the EMPr can be discussed. The discussions on the EMPr must continue for the life of the construction phase with the last meeting being held two months after construction has been terminated. This final meeting should be preceded by a final site audit by the external ECO. The audit will be presented at this final meeting. The Resident Engineer or his representative may call for additional meetings in response to particular environmental problems. The Site Environmental Officer will attend progress meetings if requested to do so by the Resident Engineer or his representative. The Site Environmental Officer shall decide whether other specialists (archaeologist, landscape architect, restoration ecologist etc.) need to attend various meetings or not. At each of the meetings contractors will report performance against their defined EMPr objectives and targets. The DEDEAT and any other relevant authority must be represented at meetings.

Chapter 4: Environmental Management Program Requirements

Introduction

The Environmental Management Requirements are designed to address regulatory conditions as well as the issues and impacts raised through the environmental assessment as they relate to the construction and operational phases of the development. Each of the Environmental Management Requirements is presented as follows:

Objective: potentially significant impacts to be mitigated.

Aspects: activities likely to cause significant impacts - this list is not exhaustive and other unspecified activities might also cause the respective significant impacts (to be monitored and addressed where required)

Procedure: steps and/or actions required to manage and minimise/prevent the relevant aspects.

Target: the level of performance, sometimes determined by legislation, which must be met.

General Conditions and Prerequisites for Construction Activities

The following section identifies the management actions relevant to construction phase that must be completed prior to the commencement of construction activities.

Objective:

To ensure that all conditions and requirements of the Environmental Authorisation, Water Use Authorisation, and the EMPr stipulated as pre-requisites for construction are met.

Aspect

Actions to be completed by the developer prior to the commencement of the relevant construction activity

Procedure

Review the full Environmental Authorisation, Water Use Authorisation and EMPr and convey the outstanding actions to the responsible team member.

Targets

Ensure that all requirements of the Environmental Authorisation and Water Use Authorisation are in place and that any approval is obtained in writing prior to commencing any construction activities. Ensure that systems are in place to implement the requirements of the EMPr.

Compliance with Relevant Legislation and Regulatory Requirements

Compliance with applicable environmental legislation is listed as one of the Environmental Management Requirements in the EMPr. However, the list provided is not exhaustive and it is the responsibility of the Resident Engineer or his representative and the contractors to ensure compliance with all environmental (and other) legislation. The EO and external ECO must provide advice on this matter as and when required.

Table 2: Pertinent Legislation Applicable to Construction Phase

Issue	Legislation	Authority
Water Use and Water Quality	National Water Act (Act 36 of 1998)	Department of Water and Sanitation (DWS)
Air quality and dust generation	Air Quality Act (Act 39 of 2004)	Nelson Mandela Bay Municipality (NMBM)
Worker health and safety	Occupational Health and Safety Act, 1993 (Act 85 of 1993)	Dept Labour
A socially responsible workforce	Labour Relations Act, 1995 (Act 66 of 1995)	Dept Labour
Preservation of archaeological and cultural artefacts	National Heritage Act, (Act 25 of 1999)	Eastern Cape Heritage Resources Agency
Waste disposal	National Environmental Management: Waste Act (Act 59 of 2008) and NMBM By-Laws	Department of Economic Development, Environmental Affairs and Tourism (DEDEAT), Department of Environmental Affairs (DEA), NMBM
Noise	Environment Conservation Act 1989 (Act 73 of 1989) Sec 25 and NMBM By-Laws	DEA, NMBM
Protected Animals and Plants	Cape Provincial Ordinance 19 of 1974, National Environmental Management: Biodiversity Act (Act No 10 of 2004), National Forest Act	DEDEAT, DEA, (Department of Agriculture, Forestry and Fisheries (DAFF)
Agricultural resources	Conservation of Agricultural Resources Act (Act No 73 of 1983)	DAFF
Health issues	Health Act (Act 63 of 1977)	Department of Health
Quarry related activities and Environmental Management Plans	Mineral Act (Act 50 of 1991) Sections 38 and 39	Mineral and Energy Affairs
Toxic and hazardous substances	Hazardous Substances Act (Act 15 of 1973) National Environmental Management: Waste Act (Act 59 of 2008) National Water Act	DEA, DWS

Issue	Legislation	Authority
Fencing	Fencing Act (Act 31 of 1963)	DAFF
Alien Vegetation	Conservation of Agricultural Resources Act, NEM: Biodiversity Act (list of alien and invasive species)	DAFF, DEA

It is recommended that the Resident Engineer or his representative and / or the Contractors obtain copies of all relevant legislation. An updated file of all legislation should be maintained at the Resident Engineer or his representative's office.

Environmental Management Requirements – Construction and Decommissioning Phases

This section presents the environmental requirements for the construction and decommissioning of the development. The requirements are worded in broad terms and details of the actions to be undertaken must be presented in the Method Statement for each aspect. Method statements are compiled by the contractors or their sub-contractors and approved by the Resident Engineer or his representative and the Site Environmental Officer. All method statements are to be reviewed by the Independent ECO.

Basic Planning

Objective

To plan the construction site together with access routes and associated work areas to allow for sound environmental management and effective rehabilitation of the total site.

Aspect

All activities related to establishment of the Bloemendal Arterial, Link Road, and stormwater infrastructure.

Procedure

Compile an annotated base plan / map of the site indicating the various activity zones, roads and tracks, all stockpile areas, temporary spoil site, campsites and all other areas which will be used or altered during the construction phase.

Indicate details of the access and internal roads and track

Indicate all "no go" areas

Note the location of registered waste disposal sites

Targets

Approved site plan and procedures to implement EMPr **before commencing** with construction

Restriction of Working Areas

Objective

To restrict access to the site to reduce the potential for accidents, dust generation, water pollution, fires, and environmental damage to flora, fauna and other sensitive environmental elements. To keep the demarcated and /or fenced off work area as small as possible. To restrict access to environmentally sensitive areas.

Aspects

The effective demarcation of the construction site, the restriction/control of traffic to access and internal roads, the control of vehicles and public entering the site.

Procedure

- ❖ The demarcated area must cover as small an area as possible. This will prevent unnecessary disturbance during construction. It will also result in a smaller area requiring rehabilitation.

- ❖ Once the demarcated area has been approved a written motivation to alter the boundary must be submitted to the Resident Engineer or his representative for consideration and (possible) approval.
- ❖ The markings of the site must be maintained throughout the construction period, as and where determined by the Resident Engineer or his representative. This is to ensure that unnecessary damage is not done to the surrounding areas. It will also ensure the safety of people working on site and people moving in the vicinity of the site.
- ❖ A comprehensive set of photographs should be taken of the site prior to commencing any construction.
- ❖ At the end of construction activities all components of the marking system must be removed, to the satisfaction of the Resident Engineer or his representative.
- ❖ Vehicles must be instructed to remain on the track and deviations from the approved track must not be permitted. In exceptional circumstances where a vehicle is forced to deviate from an approved track the deviation must be rehabilitated immediately after such an event. All deviations must be reported to the Resident Engineer or his representative.
- ❖ Materials and equipment must be stored in the demarcated area only. No materials to be stored outside of fenced area.
- ❖ Production of an Area Restriction Method Statement which includes the access road

Targets

- ❖ Approved Area Restriction Method Statement.
- ❖ Demarcated work area
- ❖ Controlled access to the site for the contractors, work crews, sub-contractors
- ❖ Prohibited access to the public, with adequate sign posting.

Biodiversity

Objective

To minimise damage to biodiversity and natural habitats in the area. To re-vegetate the area as necessary to alleviate erosion potential and to improve any aesthetic issues. To promote biodiversity conservation.

Aspects

Vegetation clearing and grubbing; lighting of fires, vehicle movement, workforce, rehabilitation planning, waste management, alien vegetation control.

Procedure

- ❖ The Conservation of Agricultural Resources Act (Act 43 of 1983) states that no person shall dispense any weed in the country. In accordance with the Act every effort must be made to ensure that the site and other clearly marked areas relating to the operation and decommissioning is kept free of weeds or invasive plants.
- ❖ The Alien Invasive Species Regulations published under the NEM: Biodiversity Act must be complied with in terms of recommendations for eradicating and controlling invader species.

- ❖ If necessary, permits required for the removal of threatened/protected flora in terms of the EC Nature and Environmental Conservation Ordinance and the National Forest Act must be obtained prior to site clearing. This should be determined by a suitable specialist once the final work areas have been demarcated.
- ❖ An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles will be contracted to remove any such animals
- ❖ A Biodiversity Method Statement must be developed that considers physical boundaries to work areas, search-and-rescue of flora and fauna, storage and maintenance of cleared vegetation for use in rehabilitation and landscaping, monitoring of faunal kills during construction phase etc.
- ❖ All cleared areas must be rehabilitated with suitable indigenous vegetation upon completion of the construction works (preferably in phases) and maintained to control erosion and minimise dust and visual impacts.
- ❖ Fires are to be prohibited on and adjacent to the site.
- ❖ Environmental awareness training must include aspects related to biodiversity protection
- ❖ Vehicles must be restricted to defined access routes, and speeding must be strictly controlled to avoid collisions with fauna
- ❖ At least 1 years' worth of monitoring for alien vegetation growth and spread must be done after construction phase

Targets

- ❖ Approved Biodiversity Method Statement.
- ❖ No fires
- ❖ Successful rehabilitation of the site
- ❖ No disturbance to aquatic habitat and associated biota in surrounding areas.
- ❖ No faunal kills reported for the site and traffic routes

Cultural Historic, Archaeological and Paleontological

Objective

To limit damage to possible cultural historic, archaeological and palaeontological artefacts and sites, features and objects.

Aspects

Clearing, excavation, and related activities.

Procedure

- ❖ The Resident Engineer or his representative must ensure that all staff are trained to recognise potential cultural historic, archaeological and palaeontological artefacts and sites. The Resident Engineer or his representative must also ensure that a system is in place to halt the specific activity if such a site is identified. The Resident Engineer or his representative may consider offering a reward to personnel who identify such sites.

- ❖ If any such sites are identified construction activities in the vicinity must be halted and the find brought to the immediate attention of the Resident Engineer or his representative who will report it to the National Heritage Council and the Eastern Cape Heritage Resources Agency.
- ❖ The Resident Engineer or his representative must then arrange for the appointment of a qualified historian or archaeologist or palaeontologist to examine the site and recommend further action.
- ❖ Following consultation with the specialist, the Resident Engineer or his representative will be responsible for approving the resumption of normal activities.
- ❖ A Cultural Historic, Archaeological and Palaeontological Method Statement incorporating the above procedures and the site clearance plan, including timing, physical boundaries, the maximum depth of excavations and programming of these excavations, must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.

Targets

- ❖ Approved Archaeological/Paleontological Method Statement.
- ❖ No cultural historic, archaeological or palaeontological artefacts or sites may be purposefully damaged or destroyed (it is illegal to disturb fossils or other historic and or cultural sites and objects without the prior consent of the National Heritage Council.)

Stockpiling

Objective

To ensure appropriate storage of stockpiles to prevent dust and nuisance, erosion and sedimentation, as well as possible contamination; and to facilitate rehabilitation

Aspects

Storage of materials for construction (e.g. gravel, sand, bricks, pipes, sheeting etc.), excavated material (i.e. spoil) from cut and fill operations, imported material for road works, or any other material

Procedure

- ❖ Materials must be stockpiled in areas approved by the resident engineer and ECO within the defined working area.
- ❖ Materials must not be allowed to wash or blow away. If this is a risk, materials should be sprayed with Dustex or cover the stockpile with a suitable material (e.g. hessian). If necessary, silt fences should be erected around stockpiles to prevent material washing downslope. Stormwater runoff towards stockpile areas must be diverted away from the stockpiles
- ❖ Stockpiles may not be positioned within 50 m of any existing facilities or structures, nor within aquatic environments and their recommended buffer areas.
- ❖ Any material that has the ability to leach (and impact on soil and ground water quality) must be stored on an impervious and banded surface
- ❖ No nuisance or inconvenience shall be caused to any existing facilities

Targets

- ❖ Approved materials stockpile area

- ❖ Restriction of materials storage to designated stockpile area
- ❖ No nuisance to surrounding facilities
- ❖ Suitable cover of material stockpiles
- ❖ No contaminated runoff and/or leachate from stockpiles

Preservation of Topsoil

Objective

To reduce the size of all stripped areas and to store stripped topsoil separately for use in site rehabilitation and landscaping once construction has been completed.

Aspects

Storage of stockpiles of soil, conservation of additional topsoil areas, erosion control, weed management.

Procedure

- ❖ Topsoil must be stripped from the work area and stockpiled separately to other materials, but inside the demarcated stockpiling area. Stockpiled soils shall be neat, and the dumped soil shall be flattened immediately after placement to ensure minimum exposure to wind and water.
- ❖ Soil stockpiles must not exceed 1.5 m in height and should not be covered in plastic
- ❖ Topsoil must be utilised in the rehabilitation of the site once the construction work has been completed. Excess topsoil can be used in erosion control works on any other disturbed area.
- ❖ *Cynodon dactylon* (kweek) (or an alternative such as *Stenotaphrum secundatum* or other suitable species recommended by a restoration ecologist) should be used to re-vegetate the topsoil stockpiles if they are to be left for longer than 90 days. A typical seeding rate would be 6 kg seed per hectare (applicable only where stockpiled soil will be retained for longer than 3 months). For shorter periods a mulch of natural vegetation cut on site during the clearing operation (grass and shrubs) can be placed over the stockpiled soil.
- ❖ If required, topsoil stockpiles must be surrounded by silt fences to avoid material washing downslope. Stormwater runoff towards topsoil stockpile areas must be diverted away from the stockpiles
- ❖ The maintenance of soil erosion control measures must be strictly monitored and reported.
- ❖ Topsoil stockpiles must be kept weed free
- ❖ A Topsoil Preservation Method Statement incorporating the above procedures, including timing, must be submitted to the Resident Engineer or his representative for approval.

Targets

- ❖ Approved Topsoil Preservation Method Statement.
- ❖ All topsoil must be separately stripped and stored.
- ❖ Topsoil well preserved for use in successful rehabilitation.

Air Quality

Objective

To minimise nuisance and potential health problems, associated with dust and/or emissions from vehicles and equipment.

Aspects

Vehicle movement, transportation of fine materials, stockpiling of materials, vegetation clearing, excavation/trenching.

Procedure

- ❖ Staff should be trained to report dust-generating activities as soon as they detect them and implement the appropriate measures to control dust. Dust can be suppressed by a combination of:
 - Spraying exposed areas with water (or a binder if required), at a frequency to be determined by the Resident Engineer or his representative. Water used for dust control must be from a permitted source.
 - Compacting exposed areas
 - Using environmentally acceptable chemical and other suppression methods where appropriate
 - Covering long-term stockpiles or temporarily re-vegetating them
 - Halting dust generating activities when wind speed exceeds 35 km/h (see table below)
 - Imposing a 15 - 20 km/h speed limit on access roads
 - Re-vegetating exposed areas in a phased approach as soon as work in an area is complete.
- ❖ Any complaints about dust recorded in the complaints register must be immediately investigated by the Resident Engineer or his representative and addressed.
- ❖ No waste, vegetation or any other material shall be burnt in compliance with smoke control regulations issued in accordance with the Atmospheric Pollution Prevention Act (Act 45 of 1965) and the Air Quality Act (Act 39 of 2004).
- ❖ Vehicles transporting fine materials must be fitted with a tarp
- ❖ Vehicles and construction equipment must be inspected daily to ensure they are in sound working order to prevent emissions (e.g. generators and exhaust fumes from vehicles)

Table 3: Table of Wind Speeds to be Used as a Guide for Dust Control

Wind speed (km/h)	Designation	Description
< 2	calm	<i>smoke rises vertically, trees do not move</i>
2-5	light air	<i>smoke drift indicates wind direction</i>
6-11	light breeze	<i>weather vane moves, leaves rustle</i>
12-19	gentle breeze	<i>leaves and twigs in constant motion</i>

Wind speed (km/h)	Designation	Description
20-29	moderate breeze	<i>dust and loose paper raised, small branches move</i>
30-38	fresh breeze	<i>small trees sway</i>
39-50	strong breeze	<i>large branches move, wind whistles wires</i>
51-61	moderate gale	<i>whole trees move, walking affected</i>
62-74	fresh gale	<i>twigs break off trees, walking difficult</i>
75-86	strong gale	<i>slight structural damage occurs, branches break</i>
87-100	whole gale	<i>trees uprooted, considerable structural damage</i>
101-118	storm	<i>widespread damage</i>
119+	<i>hurricane</i>	<i>severe and extensive damage</i>

Targets

- ❖ Approved Air Quality Method Statements.
- ❖ Dust levels meet applicable standards set in terms of the NEM: Air Quality Act and the NMBM Air Pollution Control By-Law
- ❖ No complaints of dust by surrounding facilities, especially from vehicles transporting fine materials along public roads
- ❖ No emissions recorded by ECO from vehicles and equipment. Alternatively, reported emissions are appropriately dealt with.

Noise and Vibrations

Objective

To avoid disturbing surrounding land users and fauna.

Aspects

Operation of construction equipment, vehicle movement, construction staff, excavation.

Procedure

- ❖ Equipment which limits noise generation must be used.
- ❖ Construction should preferably be labour intensive and the use of heavy machinery must be avoided
- ❖ Any complaints pertaining to noise and vibrations as recorded in the complaint register must be immediately investigated by the Resident Engineer or his representative and addressed.
- ❖ Construction activities to must be limited to weekdays between 07:00 and 17:00
- ❖ Noisy vehicles, especially those travelling near residential areas, must be fitted with appropriate silencers and the drivers must be trained to drive in a manner that limits noise disturbance. No excessive hooting must be allowed

- ❖ Attempts must be made to schedule noisy activities so that they occur simultaneously and over as short a period as possible.
- ❖ Vibration inducing activities must also be simultaneously scheduled wherever possible.
- ❖ A Noise and Vibration Method Statement must be submitted by the appropriate contractors (s) to the Resident Engineer or his representative for approval.
- ❖ After hours numbers should be displayed at the entrance of the site if members of the public wish to lodge complaints

Targets

- ❖ Approved Noise and Vibration Method Statement.
- ❖ The Occupational Health and Safety Act 85 of 1993 stipulates that noise levels in excess of 85 dB (A) at 1 metre from equipment are not permitted.
- ❖ Excessive noise as determined subjectively by the Resident Engineer or his representative is not created.
- ❖ No complaints of noise by surrounding land users

Water Consumption

Objective

To minimise the consumption (and wastage) of water

Aspects

Equipment servicing areas, domestic water use, water required for construction and related activities.

Procedure

- ❖ Opportunities to reduce consumption and re-use of water must be adopted wherever possible. Measures must be put in place to capture rainwater for use at the site to reduce demand on the potable water supply.
- ❖ Methods must be employed to ensure that water is not wasted. Environmental awareness training must ensure that staff is aware of the need to conserve water and to minimise the pollution of water.
- ❖ A Water Consumption Method Statement must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.

Targets

- ❖ Approved Water Consumption Method Statement
- ❖ The Resident Engineer or his representative to set a realistic water consumption quota.

Water Quality

Objective:

To minimise the potential contamination of ground and surface water

Aspects

Poorly maintained equipment and vehicles, vehicle parking areas, materials storage, washing equipment, cement pouring/transfer, contaminated run-off from active work and storage areas, effluent from chemical loos, waste storage

Procedure

- ❖ The Resident Engineer or his representative shall ensure that all precautions are taken to ensure that no surface or ground water becomes polluted. Any deliberate or unplanned pollution of water is an offence in terms of the National Water Act (Act 36 of 1998) and is punishable with a fine to be determined by the authorities.
- ❖ Environmental awareness training must ensure that staff is aware of the need to prevent water pollution. The aim is to prevent pollution at source by good work practice, thereby limiting the chance of contaminants being carried to surface and groundwater
- ❖ All vehicles must be serviced off-site at suitable service providers. Only emergency repairs to be done over drip trays on-site.
- ❖ Refuelling to take place only at the construction camp, over drip trays.
- ❖ Vehicles that are housed overnight at the site camp must have drip trays beneath potential sources of hydrocarbon leaks
- ❖ At the start of each day, vehicles and equipment must be inspected for any signs of leaks
- ❖ A stormwater management plan must be developed for construction that considers the movement of runoff towards and from active work areas, the site camp, and stockpile areas. Care should be taken at all times to ensure that dirty water does not leave the site.
- ❖ Temporary storm-water runoff basins and drainage ditches may have to be constructed in order to capture storm-water.
- ❖ Sediment transport of storm-water must be minimised e.g. by using silt traps, silt curtains, geo-textiles, diversionary berms, soil stabilisation and temporary settling ponds.
- ❖ Details of storage of all chemicals must be submitted to the Resident Engineer or his representative for approval. Chemicals must be stored in adequately sealed containers under lock and key
- ❖ Only small volumes of fuel needed for generators should be stored on site in a designated area. Fuel must be stored in a sealed, banded area that is well ventilated. Dispensing of fuel to generators must be done over a sealed and banded surface.
- ❖ Contaminated soil (e.g. in vehicle parking areas, under generators) must be removed to an appropriate permitted solid waste disposal facility.
- ❖ Cement or concrete mixing must take place over a tray to capture any spills. Care must be taken when transferring concrete/cement from the mixing area (e.g. via wheelbarrows) to avoid spills en route to the area of use.
- ❖ A dedicated washbay area must be created to clean equipment. Washwater must not be disposed of into the surrounding area. Waste water from the wash-bay must be collected in a sealed container and taken to the municipal WWTW for disposal. Waste manifests must be obtained from the municipality to prove legal disposal
- ❖ Generators must operate over drip trays with river sand in them to capture any spills or leaks

- ❖ A spill kit must be housed on site
- ❖ All staff must be trained on how to respond to spills and polluting incidents. This includes measures to capture/control the spill, clean up procedures, remedial action required, and reporting mechanisms.
- ❖ Chemical tools must be available on site and must be frequently serviced by a registered contractor.
- ❖ A Water Quality Method Statement must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.
- ❖ Should a major polluting incident occur, the Resident Engineer or his representative shall immediately contact the regional office of the Department of Water and Sanitation (requirement of National Water Act). Clean-up shall take place in consultation with the Department.
- ❖ All spills must be reported to the ECO.

Targets

- ❖ Approved Water Management Method Statement.
- ❖ No contamination of groundwater or surface water.
- ❖ No polluting incidents. Alternatively, polluting incidents adequately contained and remedied to avoid water quality impacts on surface and groundwater in surrounding areas
- ❖ Compliance with DWS standards for discharge of effluent into a watercourse (applicable to stormwater runoff from the site)

Waste Management

Objective

To limit the potential for groundwater and surface water pollution as well as the visible and malodorous accumulation of waste materials. To prevent littering and associated environmental impacts.

Aspects

General construction and decommissioning activities

Procedure

- ❖ A system for identifying, classifying and disposing of solid waste must be devised.
- ❖ Waste should be classified as domestic (including litter), hazardous, toxic or recyclable.
- ❖ Waste materials (e.g. paper and glass) must be sorted and sent for recycling, where the quantity allows this and if the facilities are available. Certain waste materials are valuable and could be sold to (local) entrepreneurs for further use. Recyclable materials must be stored in separate containers.
- ❖ No littering is permitted on site; litterbins must be provided throughout the site. These litter bins must be predator and scavenger proof.
- ❖ No waste may be buried or burnt on site

- ❖ Bins must not be allowed to become overfull and must be emptied at least once a day or at a frequency determined by the on-site ECO based on visual inspections. Waste from bins may be temporarily stored on site at a central waste area that is wind and scavenger proof. This must be approved by the resident engineer and ECO.
- ❖ Centralised eating facilities must be provided for workers to facilitate litter control.
- ❖ All solid waste must be disposed of off-site at suitably permitted waste facilities. This includes any building rubble left after construction. The contractor must supply the resident engineer with certificates of disposal
- ❖ A register of waste disposal and sorting records must be retained by the contractors and submitted to the Resident Engineer or his representative for auditing purposes.
- ❖ Appropriate temporary disposal areas must be covered and be on an impermeable floor.
- ❖ The requirements of the Waste Act (Act 59 of 2008) and Health Act (Act 50 of 1992) are applicable to waste management.

Targets

- ❖ Approved Waste Management Plan.
- ❖ Waste appropriately stored/handled as per the norms and standards published in terms of the NEM: Waste Act and the NMBM's Integrated Waste Management Plan
- ❖ Waste that cannot be recycled removed to a registered waste disposal site.
- ❖ No dumping and litter on site or in surrounding areas

Materials handling, use, and storage

Objective

To ensure that materials are appropriately handled, stored and used.

Aspects

Storage of materials, transport of materials to the site, importing materials for use in construction

Procedure

- ❖ The contractor must ensure that delivery drivers are informed of all procedures and restrictions (including 'no-go' areas) required to comply with the specifications
- ❖ The contractor must ensure that delivery drivers are supervised during off-loading by someone with an adequate understanding of the specifications
- ❖ Materials must be properly secured to ensure safe passage between destinations. Loads including, but not limited to, sand, stone chip, fine vegetation, refuse, paper and cement shall be appropriately covered to prevent them from spilling from the vehicle during transit. The contractor will be responsible for any clean-up resulting from suppliers or employees failing to properly secure materials

- ❖ All manufactures and/or imported material shall be stored in the contractor's site camp, and if required by the project specification, out of the rain. All lay down areas outside of the site camp must be approved by the resident engineer and ECO
- ❖ Imported gravel, soil, fill and sand shall be free of weeds, alien invasive seed material, plant material, litter and contaminants; and shall be obtained from sources approved by the resident engineer. A method statement detailing source and methods to comply with this project specification must be submitted to the resident engineer.

Targets

- ❖ Approved materials storage method statement
- ❖ Approved storage areas
- ❖ No spills from transported materials

Fuel and Hazardous Materials Storage

Objective

To ensure that materials are appropriately stored to minimise the potential for pollution and accidents.

Aspects

Storage of fuels, solvents, and other hazardous and toxic substances

Procedure

- ❖ Fuel, solvents and other hazardous or toxic substances must be securely stored in a restricted, locked facility approved by the Resident Engineer or his representative.
- ❖ Fuel and hazardous materials containers must be properly and boldly labelled and as a minimum should be stored in banded, weatherproof areas. The required safety signage must be in place surrounding fuel storage areas conforming to the requirements of SABS 1186 – e.g. 'no smoking', 'no naked lights' and 'danger'.
- ❖ Fire extinguishers must be installed at the fuel store
- ❖ There must be adequate firefighting equipment surrounding storage areas
- ❖ Storage facilities must be regularly maintained.
- ❖ An emergency response plan must be formulated, including steps taken to manage the capture and treatment of polluted soil and water.
- ❖ A Fuels and Hazardous Materials Storage Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.
- ❖ Materials safety data sheets must be stored on site. Procedures specified in these sheets must be followed in the event of an emergency.
- ❖ The contractor must train all staff on site that are responsible for handling hazardous materials for their proper use, handling and disposal.

Targets

- ❖ Approved Fuels and Hazardous Materials Storage Method Statement.
- ❖ Approved Emergency Response Procedure Method Statement.
- ❖ Fuels and hazardous liquids must be stored in an impervious, bunded and covered area with a capacity of 110% of the largest single storage tank.

Social Issues

Objective

To ensure the health and safety of the construction workforce. To ensure that activities associated with construction, particularly the presence of the workforce, do not create social problems or exacerbate any which may already exist. To ensure safety of residents in the area, especially children and elderly persons.

Aspects

Staff and surrounding community welfare, health and safety

Procedure

Employment

- ❖ Contract documentation for the general construction manager (GCM) and sub-contractors to include requirements for preferential use of: local labour, designated employees in terms of the Employment Equity Act, goods and services, and SMMEs.
- ❖ Contract documentation for the GCM and sub-contractors to include requirements for the multi-skilling of construction workers
- ❖ A skills development and training program must be implemented
- ❖ Linkages with existing initiatives within the NMBM to be established to support training and SMME development
- ❖ Opportunities for downstream industries and SMME development to be facilitated
- ❖ Local sub-contractors should be employed wherever possible to maximise the localised economic benefits of the project.
- ❖ Access to the construction site must be strictly controlled.
- ❖ A policy regarding alcohol and weapons on the construction site must be formulated. This policy must be finalised prior to the commencement of work.
- ❖ A mechanism must be established to receive and address complaints from the staff.
- ❖ For security reasons, cash wages should be paid off site.
- ❖ Visitors to report to the site office, undergo induction, wear PPE and sign an indemnity form
- ❖ Construction vehicles to adhere to speed limits
- ❖ A Traffic Management Plan must be developed prior to construction commencing that deals with access routes and minimising impact on traffic flow, and safety of residents, pedestrians and cyclists.

Site Rehabilitation

Objective

To re-vegetate and stabilise areas that have been disturbed during the construction phase.

Aspects

Dismantling and removal of all construction infrastructure; site preparation for rehabilitation including tidying, shaping, rutting, topsoil application; re-vegetation and landscaping of disturbed areas on site; ensuring that adequate erosion control measures are in place, alien vegetation control

Procedure

- ❖ All construction infrastructure, equipment, materials and wastes must be removed from the site upon completion of construction (or earlier, in a phased manner, if possible).
- ❖ The disturbed area must be shaped to approximate natural contours. Consideration must be given to ponding, as well as areas of accelerated runoff that may result in channel / gully erosion
- ❖ All compacted and previously used construction areas shall be scarified to a depth of 150 mm prior to topsoil being replaced
- ❖ Stored topsoil must be replaced on disturbed areas to a depth of at least 150 mm.
- ❖ These areas must be landscaped to improve the aesthetic appearance of the site; suitably landscaped berms of topsoil may be created as part of the erosion control program.
- ❖ Any excess topsoil (not used in landscaping) must be disposed of in an environmentally acceptable manner.
- ❖ Alien vegetation must be removed from site and responsibly disposed of
- ❖ All disturbed areas must be re-vegetated with suitable (i.e. naturally occurring in the area) vegetation.
- ❖ A Site Rehabilitation Method Statement must be submitted by the contractors to the Resident Engineer or his representative for approval.
- ❖ The soil erosion measures installed need to be checked regularly.
- ❖ Specific recommendations for wetland rehabilitation provided in the aquatic specialist study must be implemented.

Targets

- ❖ Approved Site Rehabilitation Method Statement.
- ❖ Site rehabilitation to be completed within one month after the end of the construction period, or by an alternative date stipulated by the Resident Engineer or his representative.
- ❖ Site successfully rehabilitated and stable, with little to no risk of erosion.
- ❖ Wetlands and their buffer areas rehabilitated, and are functional
- ❖ Riparian areas and their buffer areas rehabilitated, and are functional

Environmental Management Requirements – Operational Phase

Maintenance of the Arterial and Link Road

Objective

To maintain the Arterial and Link Road in operational phase to allow for continued safe use.

Aspects

Maintenance of lighting, railings, walkways, cycleways, signage and road surfaces.

Procedure

The NMBM must develop a maintenance plan for the Arterial and Link Road that identifies the frequency of inspections. Sufficient funds must be set aside in annual budgets to allow for the required maintenance

Targets

- ❖ Maintenance plan in place
- ❖ Dedicated person assigned to inspections
- ❖ Adequate budget available to implement maintenance

Maintenance of Stormwater Infrastructure

Objective

To maintain stormwater infrastructure, and litter traps.

Aspects

Maintenance of stormwater infrastructure, and cleaning of litter traps to prevent contaminated flow and solid waste impacts in surrounding areas.

Procedure

The NMBM must develop a maintenance and cleaning plan for stormwater infrastructure and litter traps. A cleaning schedule must be established, and staff and budget assigned to the task.

Targets

- ❖ Maintenance and cleaning schedule in place
- ❖ No solid waste noticeable downstream of stormwater discharge points
- ❖ Staff appointed to clean litter traps

Maintaining Planted Verges

Objective

To maintain planted verges to serve as air filters and noise buffers.

Aspects

Checking status of plants, watering, soil management, weeding

Procedure

Beds are to be prepared, and vegetation that was removed during construction phase can be planted. In particular, *Portulacaria afra* must be planted, as it has demonstrated carbon sequestration properties. Beds must be inspected and maintained. Initially, until plants have established, beds should be watered weekly, especially in hot and dry periods.

Targets

- ❖ Planted road verges established, and maintained
- ❖ *Portulacaria afra* and other local indigenous species thrive in roadside verges, and assist with filtering air and buffering noise.

Response to Public Complaints

The Resident Engineer or his representative must respond to queries and complaints from the public regarding construction activities. In responding to such queries and / or complaints the Resident Engineer or his representative must document all such communications in a complaints register. All queries and complaints must be reported to the developer. All remedial action taken on a complaint must be recorded in the complaints register.

Chapter 5: Environmental Management and Monitoring Requirements

Introduction

This chapter outlines the systems to ensure that the EMPr and environmental management requirements listed in Chapter 4 are effectively implemented. This includes monitoring requirements, corrective action, and auditing. The training, incentives and supporting documentation required to effect implementation of the EMPr are also described.

Environmental Compliance Monitoring

The Resident Engineer or his representative and / or the Site Environmental Officer must devise a monitoring program to ensure compliance with the procedures and targets outlined in the previous chapter for construction phase activities.

The Resident Engineer or his representative is responsible for monitoring the procedures and targets applicable to each environmental management requirement. The Resident Engineer or his representative in conjunction with the Environmental Officer must decide on the frequency of inspections.

In operational phase, NMBM employees will inspect and maintain the condition and the roads, stormwater infrastructure and garden beds.

For each of the environmental management requirements, the specific elements listed below should be monitored. This list is intended as a guide and is not necessarily exhaustive; consequently, other elements might need to be monitored to ensure compliance with the relevant target.

Construction Phase

Restriction of Access to Sites

- ❖ The Site Environmental Officer should inspect the demarcated area on a regular basis and inform the contractors of any violations or areas where markings / fencing must be replaced. Checks must also be done to determine if vehicles are adhering to demarcated access routes, turning circles and parking areas.

Biodiversity

- ❖ The EO must inspect wetlands and watercourse crossings on a daily basis to check for any signs of erosion, alien vegetation establishment and flow modification
- ❖ The EO must monitor construction activities on a daily basis to prevent pollution of the watercourse by good construction practice

Cultural Historic, Archaeology and Paleontology

During earthmoving, excavation and site rehabilitation the Site Environmental Officer must monitor for potential cultural historic, archaeological and paleontological sites daily, or more frequently at his/her discretion.

Preservation of Topsoil

- ❖ Regular checks need to be undertaken on the storage of the topsoil and the state of the vegetation or mulch covering the topsoil.
- ❖ Checks on the erosion of the area must be carried out regularly, and it must be ensured that the erosion minimisation measures installed are effective.
- ❖ Stockpiles must be monitored for weeds.

Air Quality

- ❖ Dust must be visually monitored on a regular basis (daily), or more frequently in conditions conducive to dust generation, as determined by the Site Environmental Officer.
- ❖ Vehicles and construction equipment must be inspected daily to determine if they are in sound working order to prevent emissions.

Noise and Vibrations

- ❖ Noise created by construction activities must adhere to noise regulations set for the NMBM, as well as noise regulations of the Occupational Health and Safety Act No 85 of 1993.

Water Consumption

- ❖ Daily consumption of water must be monitored and recorded against the set water quota. Any excessive usage or peaks must be investigated.

Water Quality

- ❖ The Site Environmental Officer must visually inspect runoff basins, drainage ditches and sediment traps on a daily basis to ensure that they are in an acceptable condition.
- ❖ Other potential sources of surface and surface and groundwater pollution must be inspected daily (e.g. fuel and materials storage areas, vehicles and construction equipment, waste storage areas, chemical loos, cement mixing areas).

Waste Management

- ❖ The Site Environmental Officer must inspect on-site waste disposal facilities / temporary storage areas daily, to ensure that they are sufficient and that they are properly maintained.
- ❖ During site inspections the Site Environmental Officer must check for waste material, which is inappropriately (temporarily) disposed of or stored.
- ❖ A record must be kept of waste that is disposed of at the landfill site and/or recycled

Fuel and Hazardous Materials Storage

- ❖ The Site Environmental Officer must ensure that materials are stored in the designated area set aside for that purpose.
- ❖ During daily site inspections the Site Environmental Officer must check storage facilities to ensure that they are in a proper state of repair.
- ❖ A record must be kept of any spills and what follow-up action was taken

Site Rehabilitation

- ❖ The Site Environmental Officer must monitor site landscaping and re-vegetation, commencing after construction in phased areas
- ❖ Monitor the erosion control measures.

Site Housekeeping

- ❖ The Site Environmental Officer must monitor the site for litter and other waste material

Operational Phase

Road Maintenance

- ❖ A suitably qualified engineer or similar technical person in the employ at the NMBM must monitor the integrity of the roads associated features (e.g. lighting, rails, walkways etc.)

Stormwater Infrastructure

- ❖ A suitably qualified engineer or similar technical person in the employ at the NMBM must monitor the integrity of the stormwater infrastructure and litter traps
- ❖ A dedicated person must do regular inspections of litter traps, and remove solid waste to landfill site

Planted Verges

- ❖ An NMBM employee from the Parks Department must monitor the success of planting of road verges on a regular basis, and implement any required follow-up (e.g. adding topsoil, weeding).

Environmental Training

The contractors and the Resident Engineer or his representative are responsible for ensuring that all personnel have a general environmental awareness as well as specific knowledge of the potential environmental impacts associated with their work activities. All personnel associated with the project must understand the purpose and benefits of the EMP. The appropriate training must occur as part of an induction program, i.e. before commencing on-site work, and should also focus on the benefits of sound environmental management.

Specific elements of environmental awareness training should include:

- ❖ Ability to recognise archaeological and palaeontological artefacts.
- ❖ Awareness on the importance of site rehabilitation
- ❖ Instruction in temporary waste storage and disposal systems and facilities.
- ❖ Water conservation and water quality protection
- ❖ Awareness of social issues.
- ❖ Incentives and rewards for good environmental practice.
- ❖ Instruction in erosion control measures.
- ❖ Prevention of soil and surface water contamination from spills, materials handling and cement mixing.
- ❖ Response to polluting incidents – control, manage, remediate, and reporting
- ❖ Restriction to work areas – materials stores, stockpiling, vehicle movement and storage
- ❖ No speeding
- ❖ Dust generating activities – prevention, detection, mitigation
- ❖ Detection of emissions from equipment – procedures and reporting
- ❖ Faunal incidences – prevention of disturbance to fauna, reporting any faunal mortalities

- ❖ Noise prevention and control
- ❖ Soil conservation
- ❖ How to recognise alien vegetation and methods for removal, control and disposal

This list is not intended to be exclusive or exhaustive.

The Resident Engineer or his representative must devise a system (including appropriate records) to evaluate regularly the training program and recommend changes as appropriate (e.g. to co-incide with the phasing of construction activities and re-training in areas of high rates of non-compliance).

Environmental Management after the Completion of Construction on a Specific Site (Decommissioning)

Environmental management associated with the termination of construction work on a specific site is:

- ❖ All cleared areas are to be rehabilitated with indigenous vegetation suitable to the cleared area. There must be no signs of erosion.
- ❖ All visible alien plants must be removed from disturbed sites and the disturbed site rehabilitated.
- ❖ All recyclable rubble and waste, for example, scrap metal, bottles, cans and plastics are to be collected and disposed of through a registered recycling company.
- ❖ All non-recyclable rubble and solid waste be collected and disposed of at a registered waste disposal facility.
- ❖ All concrete waste is to be removed, and the rubble disposed of at a permitted facility.
- ❖ All access and service tracks are to be covered and re-vegetated with indigenous grass, to match the existing vegetation as far as possible. An erosion control procedure must be established to ensure that the tracks are rehabilitated to satisfaction and that erosion does not become a problem.

Environmental Administration Matters

Corrective and Preventive Action / Management of Environmental Problems

The Site Environmental Officer must devise a Corrective Action Procedure for implementing corrective and preventive action. The Corrective Action Procedure is to be implemented by all contractors and sub-contractors on site. This system should:

- ❖ Report non-compliance with procedures or targets identified during monitoring and inspections (on Incident Forms)
- ❖ Report other failures creating environmental problems
- ❖ Report imminent non-compliance and potential environmental problems
- ❖ Through the Resident Engineer or his representative delegate responsibility for corrective and preventive action
- ❖ Document the resolution of the reported non-compliance or environmental problem

- ❖ Impose disciplinary action where persistent non-compliance occurs.

Where possible, the Environmental Corrective Action Procedure should be integrated with the Quality, Health, Safety and, possibly, Maintenance, Corrective Action Procedures.

All contractors and sub-contractors must retain copies of the Corrective Action Procedure and other appropriate documentation and submit copies of all documentation to the Resident Engineer or his representative at a frequency to be determined by the Resident Engineer or his representative. The Resident Engineer or his representative must report to the developer on a monthly basis on the implementation of the EMPr.

Documentation

The Site Environmental Officer and Resident Engineer or his representative must devise forms (i.e. *pro forma*) for:

- ❖ Daily, weekly and monthly (or as appropriate) monitoring of environmental management requirements and targets (these should be integrated with those for Quality, Health, Safety and, possibly, Maintenance).
- ❖ Non-compliance (time, offender), including a register of “offenders”
- ❖ Recommended corrective action
- ❖ Resolution of non-compliance problems

These records should be made available for review by the developer and the Environmental Consultant.

The Site Environmental Control Officer and Resident Engineer or his representative must also devise forms for:

- ❖ Method Statements
- ❖ Logging complaints received in a complaints register
- ❖ Spills registers
- ❖ Waste registers
- ❖ Evaluating the environmental awareness training program
- ❖ Evaluating the job-specific environmental training plans
- ❖ Auditing of activities

The Site Environmental Officer, Resident Engineer or his representative, Contractor and sub-contractors must keep a record of all meetings attended, waste disposal documents, audits undertaken and other environmental issues as appropriate.

Penalties

Transgressions relate to actions by the contractor, sub-contractor or contractor team member whereby damage or harm is inflicted upon the environment or any feature of the environment and where any of the conditions or specifications of the EMPr are infringed upon.

In the instance of environmental damage, the damage, where possible, is to be repaired and rehabilitated using appropriate measures, as specified and undertaken by appropriate specialists, for the account of the contractor or other guilty party.

Where infringement of the specifications or conditions of the EMPr is registered, appropriate remedial action or measures are to be implemented for the account of the contractor. Where non-repairable damage is inflicted upon the environment or non-compliance with any of the EMPr conditions is registered, the contractor may face a monetary penalty to an amount specified by the Site Environmental Control Officer in conjunction with the Resident Engineer or his representative. A first offence warning may be implemented.

Incentives

Where commendable performance by a contractor, sub-contractor or team member is noted for work undertaken on site, in particular with regard to compliance with the specifications of the EMPr, the Site Environmental Control Officer in conjunction with the Resident Engineer or his representative may issue an Environmental Performance Certificate to the individual or team which has earned such recognition.

Chapter 6: Glossary of Terms

Term	Explanation
Ambient (air)	Current surrounding atmospheric condition
dB(A) (decibels A-scale)	A frequency-weighted noise unit used for traffic and industrial noise measurement
Environment	The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation
Environmental Aspect	An element of an organisation's activities, products or services that can interact with the environment
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action. An environmental evaluation or assessment is a study of the environmental effects of a decision, activity or undertaking. It is most often used within an IEM Planning process as a decision support tool to compare different options
Environmental Management System	The part of the overall management system that includes organisational structure, Planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy
Exotic	Any Plant species not falling under the indigenous definition.
Integrated Environmental Management (IEM)	A process that involves the authorities and public, and integrates environmental issues with all aspects of planning*
Invasive	Tending to displace, or increase in cover relative to, surrounding vegetation.
Palaeontology	(study of) life in geological past