ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENTAL MANAGEMENT PROGRAMME

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# ESKOM DUVHA POWER STATION STORMWATER V-DITCH

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# 1 INTRODUCTION

The purpose of an Environmental Management Programme (EMPr) is to guide the planning and design, construction and operational phases of the development. The EMPr should be developed in parallel with the planning and design phase, which enables environmental guidelines and criteria to be incorporated into the detailed design. This is done to eliminate or mitigate the various possible risks to the environment and its surrounding inhabitants during the planning and pre-construction phase. And it will subsequently ensure that minimal damage will occur to these areas during the construction and operational phases of a project.

# 2 PHASES, ROLES & RESPONSIBILITIES

## 2.1 Phases of the Project

The point of departure for any EMPr is to take a pro-active route by addressing and minimising any potentially significant problem before it occurs. In particular this EMPr deals with the following phases:

### 2.1.1 Planning or Design Phase

It is essential that possible problematic situations be eliminated or mitigated during the planning phase, to ensure that contingency plans are prepared for any possible accidental situation that may arise during the construction phase. By having these contingency plans in order before construction starts it will limit any further potentially detrimental impacts to the environment and its surrounding inhabitants.

### 2.1.2 Construction Phase

The majority of possible impacts on a site would occur during the construction phase, and most of them will have immediate effect. It is therefore vital that the site is monitored on a continual basis during this phase, as it would be possible to identify and correct these impacts as they occur, thus minimising their possible impact.

### 2.1.3 Operational Phase

By being pro-active during the design and construction phases, potentially harmful impacts originating in the operational phase will be minimised or eliminated.

### 2.1.4 Decommissioning Phase

Thoughtful design, thorough monitoring and strict adherence to the EMPr during the construction and operational phases will ensure that the decommissioning phase (if and when applicable) will be done efficiently and with minimal damage to the bio-physical and social environments.

## 2.2 Roles and Responsibilities

Various role players have a range of responsibilities to perform during the different phases of a project:

### 2.2.1 Contract Manager (CM) (Developer Representative)

- The CM will be responsible for overseeing the contract from initiation to completion of construction on the site
- The CM will appoint a team of contractors, which will be responsible for the construction of the entire project
- The CM will be responsible for ensuring that the development is implemented according to the requirements as set out in the EMPr
- The CM should ensure that sufficient resources are available to the other role players to efficiently perform their tasks in terms of the EMPr
- The CM must appoint an independent ECO to ensure strict adherence to the EMPr

### 2.2.2 Engineer (Eng)

An engineer act as a direct, on-site resource for all technical aspects related to the development. He is available on the construction site at all times, overseeing all phases of the construction activities.

### 2.2.3 Environmental Control Officer (ECO)

The ECO will be appointed at the start of the construction phase and is mandated to do the following:

- Ensure that all contractors/subcontractors/employees are fully aware of their environmental responsibilities. This will take the form of an initial environmental awareness-training program in which requirements of this document will be explained
- Any damage to the environment must be repaired as soon as possible after consultation between the ECO, Consulting Engineer and Contractor
- The ECO shall monitor their actions to ensure that the developer staff and/or contractor are adhering to all stipulations of the EMPr
- The ECO shall be responsible for monitoring the construction activities throughout the project by means of site visits and meetings. This should be documented as part of the site meeting minutes
- The ECO must sign off that the PM certify that they shall ensure that all clean-up and rehabilitation or any remedial action required, are completed prior to transfer of properties
- A post construction environmental audit is to be conducted to ensure that all conditions in the EMPr have been adhered to

# 3 IMPLEMENTATION AND MONITORING

## 3.1 Auditing/Inspections

- The appointed ECO on a regular basis, and also ad hoc basis will inspect the site where necessary
- The CM as well as the contractor's representative will accompany the ECO, on-site inspections
- The contractor will use the formats presented in this EMPr to report to the CM as to the compliance to this document

When, in the opinion of the ECO, a construction activity will result in environmental damage, the ECO will issue instructions to the CM, who will in turn order the Contractor to halt the activity. Spot fines or penalties may be levied for non-compliance.

## 3.2 Methods Statements

Methods statements from the Principal contractor and/or subcontractor – where applicable - will be required for specific sensitive actions on request of the authorities or ECO. All method statements will form part of the EMPr documentation and are subject to all terms and conditions contained within the EMPr document. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of the ECO, the format should clearly indicate the following:

- What – a brief description of the work to be undertaken
- How – a detailed description of the process of work, methods and materials
- Where – a description / sketch map of the locality of work
- When – the sequencing (phases) of actions with commencement date and completion date estimates

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ECO.

## 3.3 Record Keeping

All records related to the implementation of this management plan (e.g. site instruction book, ECO diary, methods statements etc.) must be kept together in an office where it is safe. Records should be kept for two years and at any time be available for scrutiny by any relevant authority.

# 4 STANDARDS

- The ECO will keep written and photographic records of the site and its surroundings before, after and during construction on the site
- The Contractor will keep records of construction activities, instructions received from the ECO and CM concerning environmental matters
- The ECO will keep records of cases of non-compliance and remedial actions taken
- Where no quantitative standards are applicable, visual standards will apply
- The contractor will rehabilitate the site to a condition acceptable to the ECO, and respond timeously to any complaints and instructions regarding construction activities

# 5 EMPr OBJECTIVES

This EMPr must be used during the pre-construction, construction and operational phases of the proposed project.

The objectives of this plan are to:

- Ensure all environmental safeguards are carried out correctly
- Manage site activities effectively and coordinate with other trades
- Minimise adverse impacts on the environment
- Ensure that environmental mitigation measures are in place from the start of the project
- Minimise disruption to fauna and flora
- Monitor the project

# 6 EMPr CONTEXT AND ENVIRONMENTAL AUTHORISATION CONDITIONS

This EMPr fits into the overall planning process of the project and should be implemented by the developer as soon as the authorities have approved it. A copy of the EMPr should always be available on site. All contractors and sub-contractors are to be familiar with the EMPr and its contents.

# 7 LEGISLATION

The EMPr is compiled in order to comply with the following legislation.

Table 1: Legislation

| Legislation | Sections | Relates to |
|---|---|---|
| The Constitution (No 108 of 1996) | Chapter 2 | Bill of Rights |
| | Section 24 | Environmental rights. |
| National Environmental Management Act (No 107 of 1998 [as amended]) | Section 2 | Defines the strategic environmental management goals and objectives of the government. Applies through-out the country to the actions of all organs of state that may significantly affect the environment. |
| | Section 24 | Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment. |
| | Section 28 | The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care. |
| Environment Conservation Act (No 73 of 1989) and regulations | Sections 19 and | Prevention of littering by employees and subcontractors during construction and the maintenance phases of the proposed project |
| National Heritage Resources Act (No 25 of 1999) and regulations | Section 32 | No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site. |

| | | |
|---|---|---|
| | Section 34 | No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. Grave is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place. |
| National Environmental Management Biodiversity Act (Act No. 10 of 2004) | | Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources. |
| Occupational Health and Safety Act (No 85 of 1993) | Section 8 | Control of dust |
| | Section 9 | Control of noise |
| National Water Act (No 36 of 1998) and regulations | Section 19 | General duties of employers to their employees |
| | Section 20 | General duties of employers and self-employed persons to persons other than their employees |
| | Section 21 | A Water Use License Application is required for construction activities within any 1:100 year flood lines |
| National Road Traffic Act (No 93 of 1996) | | Road safety |
| Town Planning and Townships Ordinance 15 of 1986 | | Town Planning |
| SANS 10103 (Noise Regulations) | | The measurement and rating of environmental noise with respect to annoyance and to speech communication |
| Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (as amended) | | To provide for control over the utilisation of the natural agricultural resources in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. |

In the South African legislative framework, the National Environmental Management Act No. 107 of 1998, as amended (NEMA) regulates development activities, which may pose a risk to the integrity of the ecological and human environment. Coupled with NEMA, listed activities are provided, which describe the types, limits, expanse and nature of developments that require a Basic Environmental Assessment Process, in application for Environmental Authorisation prior to commencement.

The following construction activities required Environmental Authorisation:

Table 2: Listed Activities

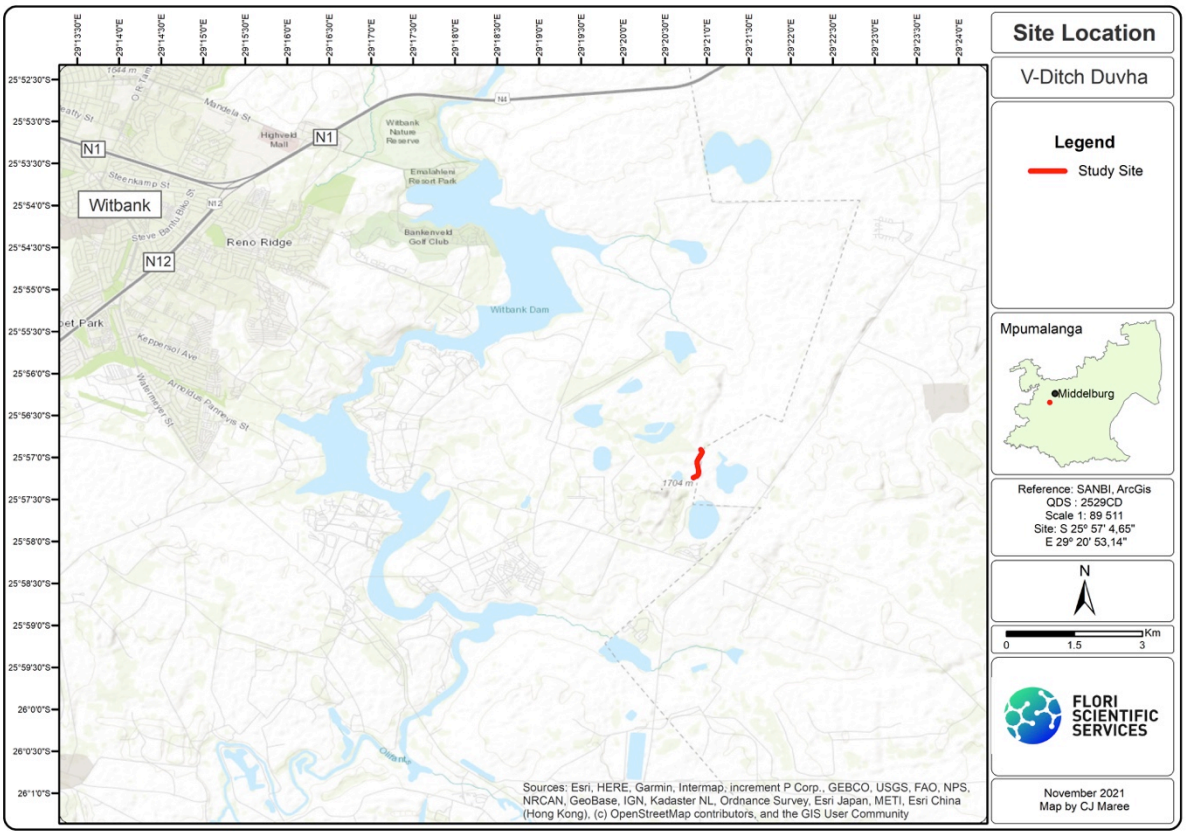
| Listed Activity | Activity/Project Description |
|---|---|
| GN R. 327/2017<br>Listing Notice 1 Activity 12<br>The development of—<br>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or<br>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;<br>where such development occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback; or<br>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —<br>excluding—<br>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;<br>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; | The proposed upgrade of the existing storm water channel of 703m long and 3.75m wide equals a physical footprint of 2 636.25m$^{2.}$ The channel traverses a watercourse (wetland). |

| | |
|---|---|
| (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;<br>(dd) where such development occurs within an urban area;<br>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or<br>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. | |
| GN R. 327/2017<br>Listing Notice 1 Activity 19<br>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;<br>but excluding where such infilling, depositing, dredging, excavation, removal or moving—<br>(a) will occur behind a development setback;<br>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;<br>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;<br>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or<br>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. | The current storm water channel is 703m long and in a wetland area and will be upgraded and expanded. Infilling and excavation will take place. |
| GN R. 327/2017<br>Listing Notice 1 Activity 27<br>The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—<br>(i) the undertaking of a linear activity; or<br>(ii) maintenance purposes undertaken in accordance with a maintenance management plan. | The construction phase footprint should kept to a width of 20m each side of the existing V-Ditch. An area of 40m wide X 703m long = 28 120m$^2$ will be cleared of vegetation. This equals 2.812ha. |
| GN R. 327/2017<br>Listing Notice 1 Activity 45<br>The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure—<br>(i) has an internal diameter of 0,36 metres or more; or<br>(ii) has a peak throughput of 120 litres per second or more; and<br>(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or<br>(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;<br>excluding where such expansion—<br>(a) relates to transportation of water or storm water within a road reserve or railway line reserve; or<br>(b) will occur within an urban area. | The existing storm water channel has a peak throughput of 12 200 litres per second and the proposed upgraded V-ditch will have a peak throughput of 20 000 litres per second. The throughput capacity of the facility or infrastructure will therefore be increased by 64%. |
| GN R. 327/2017<br>Listing Notice 1 Activity 46<br>The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—<br>(i) has an internal diameter of 0,36 metres or more; or<br>(ii) has a peak throughput of 120 litres per second or more; and<br>(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or | The existing channel has a peak throughput of 12 200 litres per second and the proposed upgraded V-ditch will have a peak throughput of 20 000 litres per second. The throughput capacity of the facility or infrastructure will therefore be increased by 64%. The water is contaminated storm water. |

| | |
|---|---|
| (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;<br>excluding where such expansion—<br>(aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or<br>(bb) will occur within an urban area. | |
| GN R. 327/2017<br>Listing Notice 1 Activity 48<br>The expansion of—<br>(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or<br>(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;<br>where such expansion occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback; or<br>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;<br>excluding—<br>(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;<br>(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;<br>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;<br>(dd) where such expansion occurs within an urban area; or<br>(ee) where such expansion occurs within existing roads, road reserves or railway line reserves. | The current storm water channel is 703m long in a wetland area and will be upgraded and expanded.<br><br>The existing channel has the following dimensions:<br>Top - 1.15m<br>Bottom - 0.2m<br><br>The proposed channel has the following dimensions:<br>Top - 3.75m<br>Bottom - 1.25m<br><br>Thus the increase in footprint will be approximately:<br>Top proposed channel 3.75 – top existing channel 1.15 = 2.6m x length (703m) = 1 827,8$m^2$ |

## 8 PROJECT LOCATION

The proposed project is located approximately 20 kms south east of Emalahleni (Witbank), and falls within the Emalahleni Local Municipality, Mpumalanga Province. Duvha Power Station is at coordinate 25°57′50″S 29°20′14″E on the Old Bethal Road situated between the R544 and the R575. The project location is set out in the Location Maps below. (Refer to Appendix A for Site Location maps.)



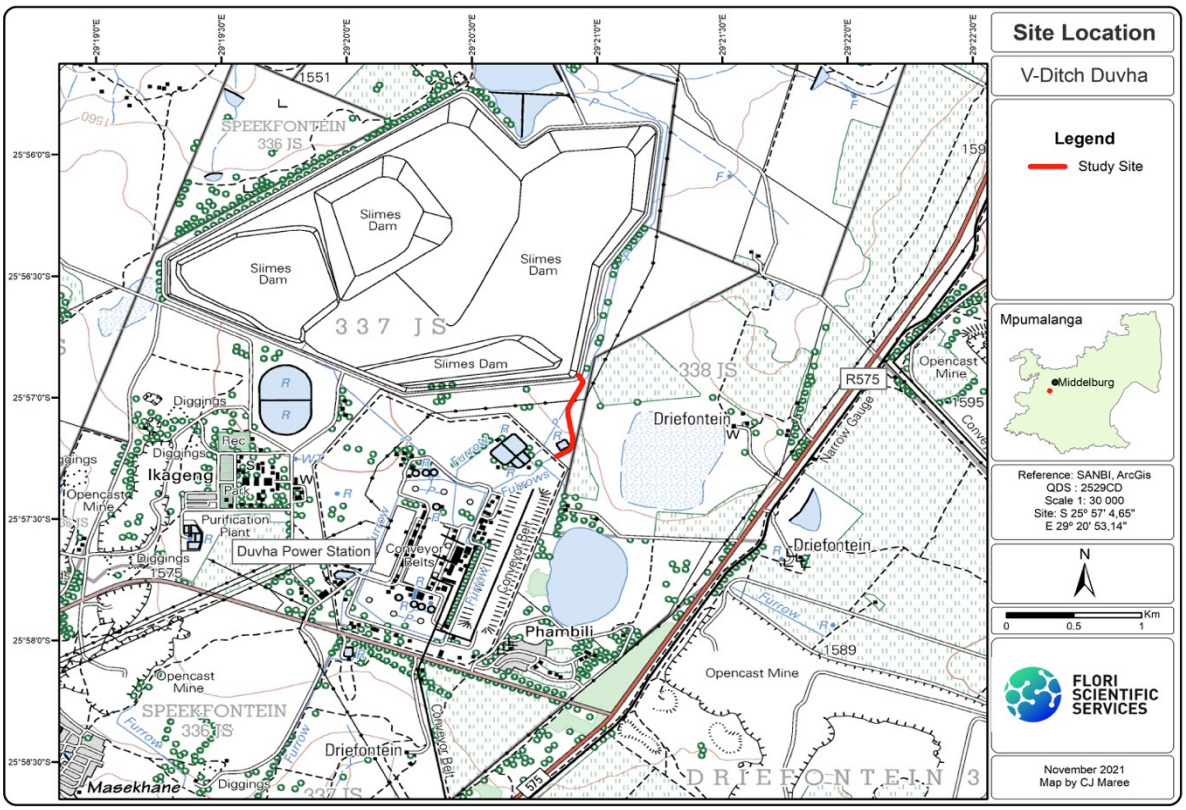




Figure 1& 2: Site Location


Figure 3: Site location (Google Earth)

The study site, which is a section of the existing open canal V-Ditch, is situated on the property of the Eskom Duvha Power Station. The Duvha Power Station is situated on the Old Bethal Road, between the R554 and R575.
Below are some of the main GPS coordinates for the project:

- Start of V-Dtich: 25°57'14.60"S; 29°20'50.30"E.
- End of V-Ditch: 25°56'54.60"S; 29°20'55.60"E.
- Oil & Grit Traps: 25°57'12.14"S; 29°20'51.75"E.
- Duvha Power Station (Main Gate Entrance): 25°57'46.72"S; 29°19'58.05"E.

## 9 PROPERTY DESCRIPTION

The property description is Remaining Extent of Farm DUVHA KRAGSTASIE 337 JS, with Surveyor General code of T0JS00000000033700000. The Quarter Degree Square (QDS) is 2529CD. The study area is situated within the Olifants River, Olifants WMA (B11G Quaternary Catchment).

## 10 PROJECT OVERVIEW

Duvha Power Station in Mpumalanga, South Africa, is a coal-fired power plant operated by Eskom. Construction of Duvha Power Station started in November 1975 and the last unit came into operation in 1984.

The scope of the current proposal is to apply for an Environmental Authorisation (EA) and a Water Use Licence (WUL) for the proposed upgrade and then operation of an existing stormwater channel at Duvha Power Station. The stormwater V-ditch (channel) is situated between the oil skimming facilities and the solution trenches for the ash tailings dam.

The concentrated contaminated stormwater run-off from the "dirty" (polluted) areas of the Power Station is redirected through the oil skimming plant, via the stormwater V-ditch, into the existing stormwater pollution control and solution trenches of the ash dam and into the return water dam (The Low-level Dam).

Figure 4: Basic Layout and Position of the Stormwater V-ditch

The V-ditch has a length of approximately 703m, conveying contaminated stormwater (which originated on the Power Station area) from the oil skimming facilities and the solution trenches for the ash tailings dam (south-west corner). The contaminated stormwater is then conveyed via existing solution and contaminated stormwater trenches of the ash tailings dam to the Low-level Dam (Return water dam for the ash tailings facilities). From where it is reused for ash quenching and slurring of ash to the ash tailings dam.
The current V-ditch has been identified to have insufficient capacity to convey the concentrated contaminated stormwater from the Power Station's operational area during a "calculated" 1:50-year rainstorm event. The V-ditch might as a result overtop during a heavy rainstorm event. Contaminated stormwater will then flood and contaminate the surrounding area including a wetland. In addition, the existing V-ditch's lining has deteriorated. This will also potentially allow contaminated stormwater to leach into the natural environment and wetland. This is a risk as identified by Duvha Power Station. Plans have been proposed to upgrade the existing V-ditch, by increasing the size (capacity) and reconstructing the lining, in order to conform to the Duvha Power Station WUL.

The existing channel has a peak throughput of 12 200 litres per second and the proposed upgraded V-ditch will have a peak throughput of 20 000 litres per second. The throughput capacity of the facility or infrastructure will therefore be increased by 64%. This estimate is based on the averaged dimensions of the channel as the existing lining is damaged and erosion has occurred along various sections of the channel.

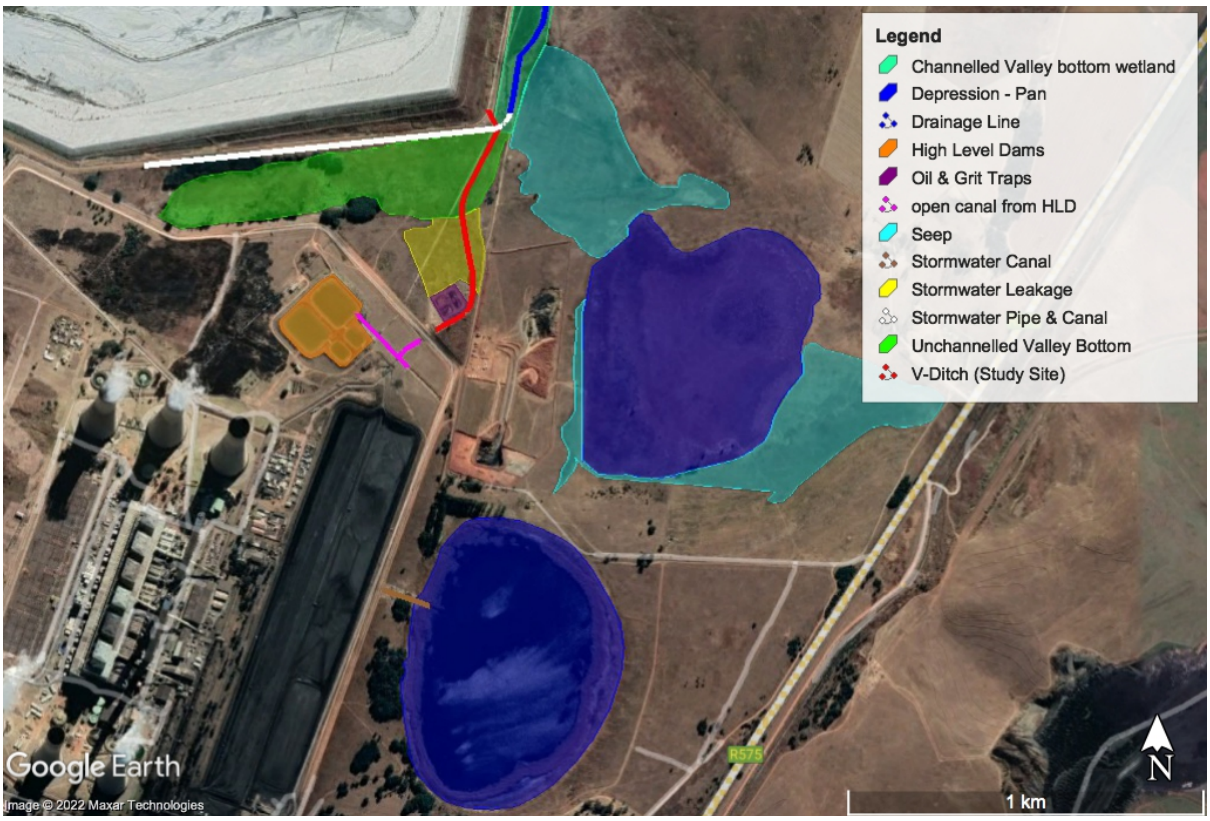
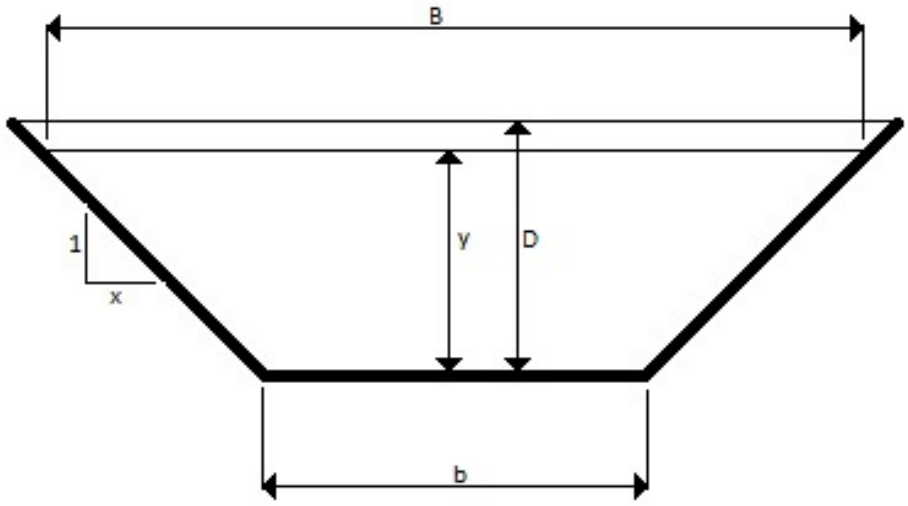


Figure 5: Project Area

Figure 6, below, is a cross sectional diagram of the proposed shape of the proposed upgraded and repair of the lining of the V-ditch. The shape will be slightly altered from the current V-ditch shape to a trapezoidal shape. The flatter broader bottom of the channel is more cost effective (depth and material used). Further, the channel will be shallower and safer, limiting the potential impact on the movement of animals and for the safety of people on site.




y = 1.225 m
D = 1.6 m
b = 1.25 m
x = 1
B = 3.75m

Figure 6: Basic Layout of the stormwater V-ditch

A detailed method statement will be drawn up by the Contractor and approved by Eskom before work may start, it is however envisaged that the following steps will be taken during the construction phase:

- Contractor to decide how many sections the area of work will be divided into and how many sections will have work carried on simultaneously.
- At each section where work is carried on the contractor will need to construct a water diversion work, capable of diverting the maximum expected storm event of (1:50 year).

- The water diversion work is envisaged to consist of a dam or ponding area where water can be collected and pumped to the end of the current work section to continue the flow down the channel
- At each section the work will consist of the following high-level items:
  - Construction of water diversion works
  - Removal of old lining and vegetation
  - Enlargement of channel section
  - Construction of new lining
  - Decommissioning of the water diversion works
  - Rehabilitation of any disturbed areas that are adjacent to the channel

## 11 ENVIRONMENTAL APPLICATION: COMPONENT DESCRIPTION

The structure of the V-ditch has not been included in previous EIAs because the channel has been operational since the 1980s. The V-ditch is to be upgraded, including a new lining, to convey an additional volume of contaminated stormwater. However, because the construction of the V-ditch is within 500 meters and/or through a wetland, the construction and operation of the V-ditch is a listed activity in terms of Sections 24(2) and 24(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) (as amended).

Authorisation is for the following:

- Construction of the V-ditch through a watercourse.
- The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, or rock of more than 10 cubic metres from a watercourse (wetland).
- The clearance of an area of 1 hectares or more of indigenous vegetation (2.18ha)
- The expansion of infrastructure for the bulk transportation of storm water where the existing infrastructure-
  - has a peak throughput of 120 litres per second or more; and
  - where the throughput capacity of the infrastructure will be increased by 10% or more.
- The expansion and related operation of infrastructure for the bulk transportation of waste water, where the existing infrastructure-
  - has a peak throughput of 120 litres per second or more; and
  - where the throughput capacity of the infrastructure will be increased by 10% or more.
- The expansion of infrastructure where the physical footprint is expanded by 100 square metres or more; or
  - where such expansion occurs—
    - within a watercourse.

## 12 RECEIVING ENVIRONMENT

- The study site is situated within the original extent of Eastern Highveld Grassland and Rand Highveld Grassland. Both veldtypes / ecosystems are threatened with statuses of "Vulnerable'.
- There are a number of natural and artificial wetlands in the study area and within a 500m radius of the study area.
- The study site is not within any national priority areas such as protected areas, important bird areas, etc.
- The study site is not within any demarcated critical biodiversity areas (CBAs) or ecological support areas (ESAs).
- According to the national screening tool desktop assessment the sensitivities of the various environmental themes are as follows:
  - Terrestrial biodiversity combined theme sensitivity: Very High.
  - Aquatic biodiversity combined theme sensitivity: Low.
  - Plant species theme sensitivity: Medium.
  - Animal species theme sensitivity: Medium.
- Site investigations (ground-truthing / verification) disputes the sensitivities of the screening tool and found them to be as follows:
  - Terrestrial biodiversity combined theme sensitivity: Medium.
  - Aquatic biodiversity combined theme sensitivity: Low.
  - Plant species theme sensitivity: Low.

  - Animal species theme sensitivity: Low.
- There are in reality no 'high sensitive' areas or habitats within the study site or immediately adjacent to the study site (V-Ditch). However, the larger functioning of the ecosystems have been taken into account as well as the fact that watercourses are, by default, considered sensitive.
- All relevant watercourses have been delineated and assessed and their PES and EIS ratings area as follows:
  - Pans: PES – Category C (Moderately Modified); EIS – Category C (Moderate)
  - Valley Bottom Wetlands: PES – Category D (Largely Modified); EIS – Category D (Low)
  - Seep Wetlands: PES – Category D (Largely Modified); EIS – Category D (Low)
  - Drainage Line: Category D (Largely Modified); EIS – Category C (Moderate)
- No red data listed (RDL) or orange data listed (ODL) fauna or flora species were observed within the study area itself.

Recommendations

- No buffer zones have been recommended, as it is nonsensical in terms of the proposed project. However, the workspace (construction footprint) must be kept within a 20m wide corridor on each side of the existing V-Ditch.
- A water use licence application (WULA) process will be required. This to be verified by a WULA Specialist. No other permits or licences are thought to be necessary.
- Any temporary storage, lay-down areas or accommodation facilities to be setup in existing disturbed areas only. No temporary sites are allowed to be set up within the demarcated 'high sensitivity' areas of the delineated wetlands.
- Only existing gravel roads may be used for general access to the work site. Namely, the road along the east of the V-Ditch and the road around the ash dump.
- Additional access along the actual V-Ditch will be necessary for contractors and heavy vehicles and machinery. Therefore a 'service road along the eastern side of the V-Ditch can be established and this road must be linked to the main gravel road along the east of the site. Furthermore, this road must only be a vehicle track and not a graded, open gravel road.
- During the construction phase, two to three temporary access roads will be required and these can be from off the existing gravel road on the eastern side of the V-Ditch. These roads should also only be vehicle tracks and can be incorporated into the permanent maintenance road network. If not, then these access roads must be rehabilitated after construction.
- No permanent access roads may be constructed through the valley bottom wetland from the western side of the V-Ditch.
- A maintenance plan is required for the V-Ditch and access roads and must be implemented during the operational phase of the V-Ditch. The maintenance of the roads can form part of the routine maintenance programme for the larger Power Station Site.
- The construction phase footprint must be kept to a width of 20 m each side of the existing V-Ditch.
- No temporary laydown areas may be setup within the 'high sensitive' areas as demarcated in the report and study.
- All temporary laydown areas must be rehabilitated at the end of the construction of the new V-Ditch, but must form part of the construction phase of the project.
- An independent ECO is required to monitor the project's impact on the water environment during the construction phase.
- No temporary site offices or lay-down areas are allowed within 50m of the edge of any watercourses.
- All hazardous materials must be stored appropriately to prevent these contaminants from entering the water environment;
- All excess materials brought onto site for construction must be removed after construction.
- No open trenches or mounds of soils to be left.
- A rehabilitation plan for disturbed areas to be compiled and implemented as part of the construction phase of the project. This includes access roads and temporary laydown / site office areas.
- High alert and care must be ensured that there is not spill over, flush, or leak of polluted water from out of the V-Ditch into the nearby wetlands.

The sensitivity map for the study area is shown below.

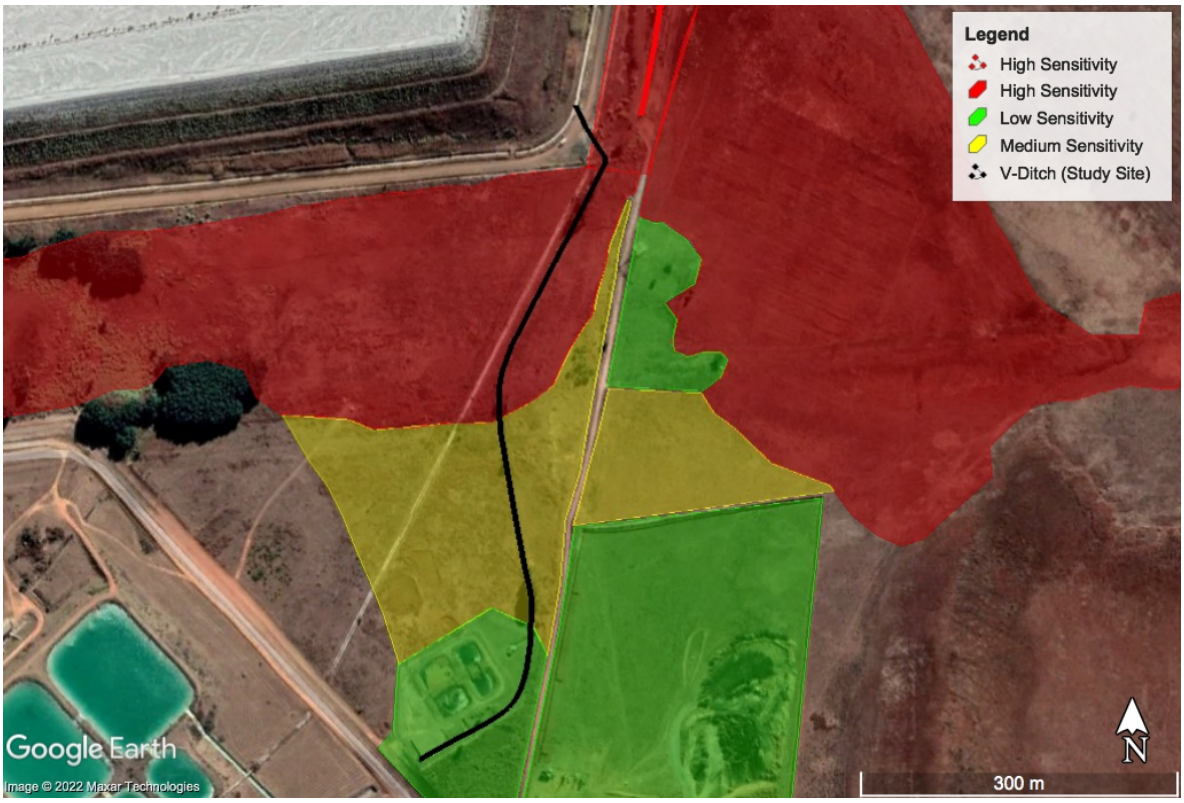



Figure 8: Sensitivity map

## 13 TIMEFRAMES

The construction activity is expected to be concluded within 2 years from the date of authorisation.

# 14 ENVIRONMENTAL MANAGEMENT PROGRAMME

Table 3: Environmental Management Programme

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| | | DS | CO | OP | DE | | | |
| **14.1 Planning** | | | | | | | | |
| a) Appointment and duties of ECO | The Developer must appoint an independent ECO who must monitor the contractor's compliance to the EMPr. The developer must provide all contractors with a copy of the EMPr. The priority of the ECO is to maintain the integrity of the development conditions as outlined in the EMPr. The ECO must form part of the project management team and attend all relevant project meetings. Once appointed the ECO details should be included in the EMPr. | ✓ | ✓ | | | DEVELOPER, ECO, CONTRACTOR | Continuous | |
| b) EMPr | This EMPr must be made binding to the Contractor, as well as sub-contractors and should be included in the tender documentation for the construction contract.<br>The EMPr is also binding to the owner during the operations of the facilities. | ✓ | ✓ | | | DEVELOPER, CONTRACT MANAGER, CONTRACTOR | Once-off | |
| c) Environmental incidents | The Contractor and Owner must take corrective action as per prescribed procedure, to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves. | | ✓ | | | CONTRACTOR, ECO | Continuous | |
| d) Flooding, erosion and sedimentation | Stormwater drainage must be in accordance with the for the South African Guidelines for Sustainable Drainage Systems, Water Research Commission Report, 2012 and Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management.<br>A stormwater management method statement must be developed and implemented. | ✓ | | ✓ | | DEVELOPER, CONTRACT MANAGER | | |
| e) Design | Founding conditions must be confirmed by a qualified Engineer. | ✓ | | | | ENGINEER | | |

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| **14.2 Soil** | | | | | | | | |
| 14.2.1 Compaction | | | | | | | | |
| a) Designated Routes | Designated routes shall be determined for the construction vehicles and designated areas for storage of equipment. These areas shall preferably be already disturbed.<br>Only existing gravel roads may be used for general access to the work site. Namely, the road along the east of the V-Ditch and the road around the ash dump.<br>Additional access along the actual V-Ditch will be necessary for contractors and heavy vehicles and machinery. Therefore a service road along the eastern side of the V-Ditch can be established and this road must be linked to the main gravel road along the east of the site. Furthermore, this road must only be a vehicle track and not a graded, open gravel road.<br>During the construction phase, two to three temporary access roads will be required and these can be from off the existing gravel road on the eastern side of the V-Ditch. These roads should also only be vehicle tracks and can be incorporated into the permanent maintenance road network. If not, then these access roads must be rehabilitated after construction.<br>No permanent access roads may be constructed through the valley bottom wetland from the western side of the V-Ditch. | ✓ | ✓ | | | CONTRACT MANAGER, ECO, CONTRACTOR | Once-off | |
| b) Access points & route | Clearly mark the site access point and routes on site to be used by construction vehicles and pedestrians. | ✓ | ✓ | | | CONTRACT MANAGER, ECO, CONTRACTOR | Once-off | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| c) Vehicular fences | Fence off areas which are off limits to vehicles | ✓ | ✓ | | | ECO, CONTRACTOR | Once-off | |
| d) Excavated areas | Mark out the areas to be excavated to ensure that only necessary areas are excavated.<br>No buffer zones have been recommended, as it is nonsensical in terms of the proposed project. However, the workspace (construction footprint) must be kept within a 20m wide corridor on each side of the existing V-Ditch. | ✓ | ✓ | | | ECO, CONTRACTOR | Once-off | |
| 14.2.2 Erosion | | | | | | | | |
| a) Erosion prevention | All surface run-offs shall be managed in such a way so as to ensure erosion of soil does not occur. All surfaces that are susceptible to erosion shall be covered with a suitable vegetative cover as soon as construction is completed. Or where erosion may potentially occur, dissipaters such as gravel beds or straw bales must be installed to prevent erosion. | ✓ | ✓ | | | ENGINEER, ECO, CONTRACTOR | Continuous | |
| b) Stockpiles | Straw bales or sandbags must be used as a mitigation measure against erosion where needed. | ✓ | ✓ | | | ECO, CONTRACTOR | Once-off | |
| c) Wet areas | No vehicles what so ever are allowed to move across sensitive areas which could cause erosion scouring and compaction.<br>No permanent access roads may be constructed through the valley bottom wetland from the western side of the V-Ditch. | | ✓ | | | CONTRACTOR | Continuous | |
| d) Clearing footprints | The area being cleared of vegetation for the construction activities must be limited to a minimum.<br>The construction footprint must be kept within a 20m wide corridor on each side of the existing V-Ditch. | | ✓ | | | CONTRACTOR, ECO | Continuous | |

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| 14.2.3 Topsoil | | | | | | | | |
| a) Stripping of topsoil | The top (200-300mm) layer (as applicable) of all areas to be excavated for the purposes of construction shall be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. This stockpiled material shall be used for the rehabilitation of the site. Weeds appearing on the stockpiled topsoil shall be removed by hand before seeding. Reusable topsoil will be collected and stockpiled at dedicated areas for the rehabilitation of the site. | ✓ | ✓ | | | CONTRACTOR | Once-off | |
| b) Storing | In order to minimize erosion and siltation and disturbance to existing vegetation, it is recommended that stockpiling be done/ equipment be stored in already disturbed/exposed areas. All stockpiles must be restricted to designated areas and are not to exceed a height of 2 metres. | ✓ | ✓ | | | ECO, CONTRACTOR | Continuous | |
| c) Grass component | When the stripping of topsoil takes place, the grass component shall be included in the stripped topsoil. The soil will contain a natural grass seed mixture that may assist in the re-growth of grass once the soil is used for back filling and rehabilitation. | | ✓ | | | CONTRACTOR | Once-off | |
| d) Infrastructure | During the laying of infrastructure topsoil shall be kept aside to cover the disturbed areas immediately after such activities are completed. Measures should be taken to ensure that no rocks or any other materials are placed on the top layer of soil. | | ✓ | | | CONTRACTOR | Continuous | |
| e) Designated areas | Stockpiling will only be done in designated places where it will not interfere with the natural drainage paths of the environment and must be properly planned according to the construction programme. All reusable material will either be used directly in fill or be stockpiled for later use in land fill zones as part of the works. | ✓ | ✓ | | | ENGINEER, ECO, CONTRACTOR | Continuous | |
| f) Runoff prevention | Care must be taken to prevent the runoff of silt from open soil and stockpiles into the sensitive areas. | | ✓ | | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| g) Removal areas | Remove vegetation only in areas designated during the planning stage. | ✓ | ✓ | | | CONTRACTOR | Once-off | |
| h) Stockpile footprint | Stockpiles must meet the requirements of the Regulation 28 of the Construction Regulations and Regulation 8 of the General Safety Regulations. | | ✓ | | | CONTRACTOR | Continuous | |
| i) Traversing topsoil | No vehicles are allowed to traverse the stockpiled topsoil areas. | | ✓ | | | CONTRACTOR | Continuous | |
| **14.3 Waste Management** | | | | | | | | |
| 14.3.1 Construction waste | | | | | | | | |
| | Waste minimisation principles must be applied during the construction and operational phases of the development. Waste must be removed from site and disposed of at a registered or licensed landfill site for the type of waste produced. All waste streams to be generated must be managed in accordance with the hierarchy of waste management principles. Proof of disposal of waste must be kept on site and made available to the Department upon request. | | | | | | | |
| a) Planning | Plan the site before starting – for access, deliveries, construction areas, washout area, waste, stockpiles, and storage. Plan routes for trucks and also vehicles with limited turning ability. Indicate this on site and on maps prior to the event. | ✓ | | | | CONTRACT MANAGER, ECO, CONTRACTOR | Once-off | |
| b) Storage | Temporary waste storage points on site shall be determined. These storage points shall be accessible by waste removal trucks and these points should not be located in areas with high visibility. These areas should also be already disturbed. The storage of solid waste on site, until such time that it may be disposed of, must be in the manner acceptable to the relevant Authority. | ✓ | ✓ | | | CONTRACT MANAGER, ECO, CONTRACTOR | Once-off | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| c) Waste Plan | Prepare and submit a Waste Management Plan to ECO. | ✓ | | | | CONSULTANT, ECO, CONTRACTOR | Once-off | |
| d) Disposal | Solid waste shall be disposed of in a manner approved by the Department of Water and Sanitation (DWS). All solid waste must be removed and transported to a recognised waste disposal site on a weekly basis. Waste disposal certificates must be obtained for all waste disposal. | ✓ | ✓ | | | CONTRACTOR | Continuous | |
| e) Record keeping | Keep records of waste reuse, recycling and disposal for future reference. Provide information to ECO. | | ✓ | | | CONTRACTOR | Continuous | |
| f) Waste removal | On completion of works, the contractor shall clear away and remove from the site all surplus material, and other fixtures of every kind. Areas thus cleared shall be graded and scarified to restore the ground as near as possible to its original profile. | | ✓ | ✓ | | CONTRACTOR | Once-off | |
| 14.3.2 Household waste | | | | | | | | |
| a) Storage | Temporary waste storage points on the site should be determined. These storage points should be accessible by waste removal trucks and these points should not be located in ecological sensitive areas. | ✓ | ✓ | ✓ | | CONTRACT MANAGER, CONTRACTOR | Once-off | |
| b) Disposal | Burning of waste is not permitted. Plant material will be spoiled at a dedicated area for the utilisation thereof as compost. | | ✓ | ✓ | | ECO, CONTRACTOR | Continuous | |
| c) Recycling | Several waste bins must be provided in offices and domestic areas and clearly marked or colour coded according to industry standards to allow for recycling of waste into<br>➢ Paper<br>➢ Biodegradable<br>➢ Glass<br>➢ Plastics<br>➢ General | | ✓ | ✓ | | | | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| d) Waste Bins | The waste bins shall be cleared by approved waste contractor. During municipal strikes special arrangements must be made to have the waste removed via private waste removal services. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| 14.3.3 Chemical waste | | | | | | | | |
| a) Design | Design the site in such a manner that chemical wastes are not located in close proximity to any fire. These areas shall be predetermined and located in areas that are already disturbed. These areas shall not be within 100 m from any watercourse area. This area should be on a concrete base to avoid any possible seepage into the soil. | ✓ | | ✓ | | CONTRACT MANAGER, CONTRACTOR | Once-off | |
| b) Contamination | Cover any wastes that are likely to wash away or contaminate storm water. Build a bund around waste storage area to stop overflow into storm water | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| | If any soil contamination occurs during the construction phases of the proposed activity, the contaminated soil must be removed to a licensed landfill site and the site must be rehabilitated to the satisfaction of the Department. | | ✓ | | | CONTRACTOR | Continuous | |
| c) Containers | All hazardous waste (fuel, lubricants, chemicals, diesel, etc) shall be placed in specifically designed containers and properly sealed. Should any fuel storage tank be required on site, the Contractor shall ensure that he has complied with the necessary legal requirements for the erection of such tanks. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| d) Collection | All containers shall be collected on a weekly basis by certified chemical removal companies. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| e) Disposal | All chemical waste shall be disposed of at a certified waste disposal site and proof of this disposal shall be sent to the contractor and ECO. | | ✓ | ✓ | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| **14.4 Fuel, Fuelling and Maintenance** | | | | | | | | |
| 14.4.1 Fuel storage | | | | | | | | |
| a) Storage | Fuel storage shall be within the construction camp, and within a bunded area with at least 110% of the volume of the amount of fuel stored, as per agreement and approval of the ECO. No storage of any fuel will be allowed on site, other than what is approved by the applicable provincial government department. | ✓ | ✓ | | | ENGINEER, CONTRACTOR | Once-off | |
| 14.4.2 Fuelling | | | | | | | | |
| a) Re-fueling | According to Construction Regulation 25 and General Safety Regulation 4, in designated areas. | ✓ | ✓ | | | ENGINEER, CONTRACTOR | Continuous | |
| b) Drip trays and spill kits | Drip trays (min 10cm deep) are to be placed under construction vehicles overnight. The drip tray must be able to contain 110% of the total amount/ volume of oil in the vehicle.<br>Spill kits must be available in all vehicles that transport hydrocarbons for dispensing to other vehicles on the site. The dispensing devices (pump heads) must be compatible with the vehicles to which they are dispensing. In addition, the dispensing devices must be fitted with the necessary valves/ apparatus that will ensure that the nozzles do not drip fuel after pumping has stopped. | | ✓ | | | ECO, CONTRACTOR | Continuous | |
| c) Decontamination | In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product. The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial | | ✓ | | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| | facility. No hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. | | | | | | | |
| d) Notification | Applicable provincial and local government departments, local municipalities and adjacent landowners must be notified within 24 hours of a potentially hazardous spillage or leak. | | ✓ | ✓ | | ENGINEER, CONTRACTOR | | |
| 14.4.3 Maintenance | | | | | | | | |
| a) Design | The maintenance yard and secured storage area will be established as far as is practicable, outside any 1:100-year flood lines. The maintenance yard should be indicated on the layout plan of the site. | ✓ | | ✓ | | CONTRACT MANAGER, CONTRACTOR OWNER | Once-off | |
| b) Maintenance area | The maintenance of vehicles and equipment used for any purpose during the development will take place only in the maintenance yard. Any breakdown in the field requires the presence of a spill treatment team and equipment. This team must prevent and mitigate any spills that occur in this situation. | | ✓ | | | ENGINEER, ECO, CONTRACTOR | Continuous | |
| c) Equipment | Equipment used in the development process must be adequately maintained so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid. | | ✓ | | | ENGINEER, CONTRACTOR | Continuous | |
| d) Machinery | Machinery or equipment used on the site must not constitute a pollution hazard in respect of the above substances. The main contractor or ECO shall order such equipment to be repaired or withdrawn from use if he or she considers the equipment or machinery to be polluting and irreparable. | | ✓ | | | ENGINEER, CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| **14.5 Air Pollution** | | | | | | | | |
| 14.5.1 Dust control | | | | | | | | |
| a) Water dampening | The liberation of dust into the surrounding environment shall be effectively controlled by the use of, *inter alia*, water spraying and/or other dust-allaying agents, such as dust nets. Regular and effective damping down of working areas (especially during the dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment. When necessary, these working areas should be damped down every 3 - 4 hours. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| b) Speed of trucks | The speed of haul trucks and other vehicles must be strictly controlled to avoid dangerous conditions and excessive dust. | | ✓ | | | CONTRACTOR | Continuous | |
| 14.5.2 Fire | | | | | | | | |
| a) Fires on site | A designated area shall be assigned for fire making by the construction workers, so as to ensure that run-away veld fires do not occur. This will reduce air pollution by excessive smoke. | ✓ | ✓ | | | CONTRACTOR | Once-off | |
| 14.5.3 Machinery | | | | | | | | |
| a) Exhaust fumes | Machinery or equipment used on the site must not constitute a pollution hazard in respect of air pollution via excessive exhaust fumes. This shall be inspected regularly by the contractor and rectified immediately. | | ✓ | | | CONTRACTOR | Continuous | |
| b) Transporting materials | All vehicles transporting material to and from a site that can be blown off (e.g. soil, rubble, etc.) must be covered with a tarpaulin. | | ✓ | | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| **14.6 Noise Pollution** | | | | | | | | |
| 14.6.1 Working hours | | | | | | | | |
| a) Construction working hours | All construction activities should be undertaken according to daylight working hours between the hours of 07:00 – 17:00 on weekdays and 7:00 –17:00 on Saturdays.<br>No construction activities may be undertaken on Sunday. | ✓ | ✓ | | | CONTRACT MANAGER, ECO, CONTRACTOR | Continuous | |
| 14.6.2 Staying on site | | | | | | | | |
| a) Construction workers | Where people stay on site, their actions and activities must be managed to avoid nuisance to adjacent occupants | | ✓ | | | CONTRACTOR | Continuous | |
| 14.6.3 Noise on site | | | | | | | | |
| a) Noise Regulations | Site workers must comply with the Provincial noise requirements as outlined in Provincial Notice No. 5479 of 1999: Noise Control Regulations. The contractor is required by contract to adhere to SABS 1200 and ISO 9000 safety measures during construction on the entire site. And to fit silencers to drilling and other machinery as required. | | ✓ | ✓ | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| **14.7 Safety and Security** | | | | | | | | |
| 14.7.1 Safety | | | | | | | | |
| a) Site and crew | The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act (85 of 1993) and the National Building Regulations. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| b) Equipment and materials | The Contractor should ensure that the handling of equipment and materials is supervised and adequately instructed. | | ✓ | | | CONTRACTOR OWNER | Continuous | |
| c) Fire extinguisher | A fire extinguisher should be accessible and the personnel should receive training in the use of a fire extinguisher. Furthermore, a fire extinguisher must at all times be available wherever welding or similar activities take place and be present on all construction vehicles. A full-time fire prevention team and the associated equipment must be available on site. | ✓ | ✓ | ✓ | | CONTRACTOR OWNER | Continuous | |
| d) Equipment and materials | The Contractor should ensure that the handling of equipment and materials is supervised and adequately instructed. | | ✓ | | | CONTRACTOR OWNER | Continuous | |
| 14.7.2 Security | | | | | | | | |
| a) Casual access | No casual access to the work camp and the construction site will be allowed. | | ✓ | | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| **14.8 Health** | | | | | | | | |
| 14.8.1 Chemical Toilets | | | | | | | | |
| a) Number of toilets | One (1) portable chemical toilet for every 30 workers must be established on site (not all in the contractor's camp, but within reasonable walking distance from where the workers are working). | ✓ | ✓ | | | CONTRACTOR | Continuous | |
| b) Location | Chemical toilets shall not be in close proximity to any natural drainage channels. Chemical toilets shall not be within 100 m of any watercourse area. It is important, however, that toilets be placed in areas where the largest number of workers is located on a daily basis. | ✓ | ✓ | | | ECO, CONTRACTOR | Continuous | |
| c) Usage | No person is allowed to use any other area than chemical toilets | | ✓ | | | CONTRACTOR | Continuous | |
| d) Inspections | Regular inspections shall be carried out to ensure that toilets are kept in a hygienic state. | | ✓ | | | CONTRACTOR | Continuous | |
| e) Toilet paper | Toilet paper shall be supplied to all toilets. | | ✓ | | | CONTRACTOR | Continuous | |
| f) Cleaning | Toilets shall be cleaned by a certified company on a weekly basis. | | ✓ | | | CONTRACTOR | Continuous | |
| g) Locking | Toilets must be secured to the ground so that they cannot be overturned, and have a sufficient locking mechanism operational at all times. | | ✓ | | | CONTRACTOR | Continuous | |
| h) Shower facilities | Shower and changing facilities must be erected separate for each sex . | | ✓ | | | CONTRACTOR | Continuous | |
| i) Eating areas | Sheltered eating areas must be provided | | ✓ | | | CONTRACTOR | Continuous | |
| **14.9 Blasting on Site** | | | | | | | | |
| a) Authorisation | In cases where blasting is required, an authorisation must be obtained from the local blasting officer at the Local Police station and the Provincial Dept of Mineral Resources and Energy. | ✓ | ✓ | | | CONTRACT MANAGER, ENGINEER, CONTRACTOR | | |
| b) Magazine area | The ECO, Contractor and Safety Officer will earmark a suitable area on | ✓ | ✓ | | | ECO, SAFETY | Once-off | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
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| | site for a temporary magazine for the duration of the construction. This magazine however will only be used to store the daily stock and not for stock to be stored for a long period. | | | | | OFFICER, CONTRACTOR | | |
| c) Blasting times | Blasting will only take place after confirmation between the ECO and Contractor. | | ✓ | | | ECO, CONTRACTOR | Continuous | |
| d) Notification | Blasting shall be limited to specific, pre-agreed periods of the day so as to minimize disturbance and shall be agreed upon with the ECO. The ECO shall be notified in writing 3 days in advance with a two weekly daily schedule of when blasting operations will take place and where so that he can notify surrounding landowners of each blasting event in writing, 24 hours in advance before blasting events will take place. | | ✓ | | | ECO, CONTRACTOR | Continuous | |
| e) Safety precautions for blasting | The National Blasting procedures and regulations must be adhered to. | | ✓ | | | ECO, CONTRACTOR | Continuous | |
| **14.10 Fauna** | | | | | | | | |
| a) Sensitive areas | No construction worker activity whatsoever will be allowed outside of the specific construction area. | ✓ | ✓ | | | CONTRACTOR | Continuous | |
| b) Snaring / hunting | Snaring and hunting of fauna by construction workers on or adjacent to the site are strictly prohibited. It should also be a condition of employment that any employees/ workers caught poaching will be dismissed. | | ✓ | | | CONTRACTOR | Continuous | |
| c) Training | Workers must be trained on how to deal with fauna species as intentional killing will not be tolerated. | | ✓ | | | ECO, CONTRACTOR | Continuous | |
| **14.11 Flora** | | | | | | | | |
| a) Site inspection | Before any vegetation is removed, a suitably qualified person (i.e. on ECO request of a vegetation specialist) shall inspect the study area for any plant/ grass/ tree species that could be transplanted to other similar/ | ✓ | ✓ | ✓ | | FLORA SPECIALIST, ECO, | Once-off | |

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| | suitable areas. This includes all Red Data or Protected, or rare plants that may be found during the flora site assessment or during construction operations.<br>Of relevance is, that no red data listed (RDL) or orange data listed (ODL) fauna or flora species were observed within the study area itself. | | | | | CONTRACTOR | | |
| b) Site access and circulation | Strictly no unauthorised access, land clearing, construction activities, vehicular traffic of any kind, or fires will be permitted external of specific construction areas or in sensitive vegetation areas. | ✓ | ✓ | ✓ | | ECO, CONTRACTOR | Continuous | |
| c) Wetland area | An application for a Water Use Licence to be submitted for construction of any activities within the wetland area. | ✓ | ✓ | | | ECO, CONTRACTOR | Continuous | |
| | The study site (V-Ditch) crosses through an artificial wetland, but which has been viewed as sensitive and needs to be approached as a 'normal, natural' wetland. The V-Ditch is also within a 500m radius of natural pans and seep wetlands to the east and southeast.<br>No buffer zones have been recommended, as it is nonsensical in terms of the proposed project. However, the workspace (construction footprint) must be kept within a 20m wide corridor on each side of the existing V-Ditch. | ✓ | ✓ | | | ECO, CONTRACTOR | Continuous | |
| d) Exotic / invader species | Removal of alien invasive species or other vegetation and follow-up procedures must be in accordance with the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).<br>All invader or exotic plant species must be removed from the site and disposed of at a landfill site. The National Department of Agriculture should be consulted during this process. | | ✓ | ✓ | | FLORA SPECIALIST, CONTRACTOR | Continuous | |
| e) Re-vegetation | The use of indigenous vegetation should be optimised during the re-vegetation of the affected areas.<br>Re-seeding of bare areas with local indigenous grasses to be part of the rehabilitation plan.<br>No exotic species to be used for rehabilitation. | ✓ | ✓ | ✓ | | FLORA SPECIALIST | Once-off | |

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| f) Wood harvesting | Wood harvesting of any trees or shrubs inside the area or adjacent areas for firewood shall be prohibited and subject to a fine. | | ✓ | ✓ | | CONTRACTOR | Continuous | |
| **14.12 Avi-fauna** | | | | | | | | |
| a) Site inspection | Any bird nests encountered in the grass or on the water must not be interfered with. If encountered must first be discussed with specialist. | ✓ | ✓ | ✓ | | AVI-FAUNA SPECIALIST, ECO, CONTRACTOR | Once-off | |
| **14.12 Storm water** | | | | | | | | |
| a) Covering of wastes | Cover any wastes that are likely to wash away or contaminate storm water | | ✓ | ✓ | | CONTRACTOR OWNER | Continuous | |
| b) Bunded area | Build a bund around waste storage area to stop overflow into storm water | | ✓ | ✓ | | CONTRACTOR OWNER | Continuous | |
| c) Natural flow | Natural storm water must flow freely, either as sheet flow or where necessary in open grass swales, to allow for infiltration and retention. Natural veld grass must be left undisturbed as far as possible, to allow natural drainage. | | ✓ | ✓ | | ENGINEER, CONTRACTOR | Continuous | |
| **14.13 Traffic Impact** | | | | | | | | |
| a) Established tracks | Access and travelling on site must follow current and established tracks only.<br>Only existing gravel roads may be used for general access to the work site. Namely, the road along the east of the V-Ditch and the road around the ash dump.<br>Additional access along the actual V-Ditch will be necessary for | ✓ | ✓ | | | CONTRACTOR | Continuous | |

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| | contractors and heavy vehicles and machinery. Therefore a 'service road along the eastern side of the V-Ditch can be established and this road must linked to the main gravel road along the east of the site. Furthermore, this road must only be a vehicle track and not a graded, open gravel road.<br>During the construction phase, two to three temporary access roads will be required and these can be from off the existing gravel road on the eastern side of the V-Ditch. These roads should also only be vehicle tracks and can be incorporated into the permanent maintenance road network. If not, then these access roads must be rehabilitated after construction.<br>No permanent access roads may be constructed through the valley bottom wetland from the western side of the V-Ditch. | | | | | | | |
| **14.14 Sensitive Areas** | | | | | | | | |
| 14.14.1 Wetlands | | | | | | | | |
| a) Wetlands | Any wetland is a 'no-go' area in terms of movement of people, vehicles and materials. | ✓ | ✓ | ✓ | | CONTRACTOR OWNER | Once-off | |
| b) Site offices or lay-down areas | No temporary site offices or lay-down areas are allowed within 50m of the edge of any watercourses. No temporary sites are allowed to be set up within the demarcated 'high sensitivity' areas of the delineated wetlands. | | ✓ | | | CONTRACTOR | Continuous | |
| c) Spills | High alert and care must be ensured that there is not spill over, flush, or leak of polluted water from out of the V-Ditch into the nearby wetlands. | | ✓ | | | CONTRACTOR | Continuous | |
| d) Access roads | No permanent access roads may be constructed through the valley bottom wetland from the western side of the V-Ditch. | ✓ | ✓ | ✓ | | ENGINEER, CONTRACTOR OWNER | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
|---|---|---|---|---|---|---|---|---|
| | | DS | CO | OP | DE | | | |
| e) No taking of water | No taking of water from water bodies for drinking or cooking purposes will be allowed, as potable water should be available on site. | | ✓ | | | CONTRACTOR | Continuous | |
| f) Sensitive zones rehabilitation | A rehabilitation plan for disturbed areas to be compiled and implemented as part of the construction phase of the project. This includes access roads and temporary laydown / site office areas. | | ✓ | ✓ | | WETLAND SPECIALIST, CONTRACTOR | Continuous | |
| 14.14.2 Rocky Outcrops – not present on this project | | | | | | | | |
| 14.14.3 Heritage / Cultural / Archaeological Sites – not present on this project | | | | | | | | |
| a) Discovery of artefacts | If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments and charcoal/ash concentrations), or other categories of heritage resources are found during the proposed activities, SAHRA must be alerted immediately, and a professional archaeologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological significance a Phase 2 rescue operation might be necessary. | | ✓ | | | CONTRACTOR, HERITAGE SPECIALIST, ECO | Continuous | |
| b) Fencing | Any archaeological sites present on site shall be fenced and at least 5 metres around it should be safeguarded from construction and development. | ✓ | ✓ | | | CONTRACTOR | Once-off | |
| c) Structures older than 60 years | No buildings / structures older than 60 years shall be damaged / demolished, or archaeological artefacts removed, without written authorisation from SAHRA. | ✓ | ✓ | | | CONTRACTOR | Continuous | |
| d) Burial grounds | Any burial ground or grave found on site will be reported immediately to the Contractor, ECO and Contract Manager. An undertaker must also be contacted who will place advertisements in the newspapers. This should | | ✓ | | | CONTRACT MANAGER, CONTRACTOR, | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
|---|---|---|---|---|---|---|---|---|
| | | DS | CO | OP | DE | | | |
| | be investigated by a specialist and recommendations made. | | | | | ECO | | |
| e) Suspicious artefacts | The ECO will be notified of any suspicious artefacts prior to it being moved or removed. | | ✓ | | | CONTRACTOR | Continuous | |
| 14.14.4 Protection of Palaeontological resources | | | | | | | | |
| a) Discovery of fossils | The following monitoring protocol must be adopted and implemented during earth moving activities:<br>The following procedure is only required if fossils are seen on the surface and when excavations commence.<br>• When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the construction activities will not be interrupted.<br>• Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 4). This information will be built into the EMP's training and awareness plan and procedures.<br>• Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.<br>• Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.<br>• If no good fossil material is recovered then no site inspections by the palaeontologist would be required. | | ✓ | | | CONTRACTOR, SPECIALIST, ECO | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
|---|---|---|---|---|---|---|---|---|
| | | DS | CO | OP | DE | | | |
| | • If no fossils are found and the excavations have finished then no further monitoring is required | | | | | | | |
| **14.15 Services** | | | | | | | | |
| 14.15.1 Disruption in services | | | | | | | | |
| a) Informing ECO | If any disruption in services are foreseen the contractor must inform the adjacent land owners and the ECO at least 4 days prior to these activities, to enable the ECO to inform the surrounding land owners of such possible disruptions. | | ✓ | | | CONTRACTOR | Continuous | |
| 14.15.2 Installation of services - not present on this project | | | | | | | | |
| **14.16 Contractor's Site Camp – might not be required on this project** | | | | | | | | |
| a) Establishment of site camp | A work site will be established and maintained for storing construction equipment on a non-sensitive area to be agreed upon by the ECO and contractor. The contractor shall furnish the Engineer on site with a site plan indicating the layout of site offices, facilities, such as chemical toilets, areas for stockpiling of materials and provision of containers. | | ✓ | | | CONTRACTOR, ECO | Once-off | |
| b) Fencing | The site camp shall be fenced and all materials shall be stored within this camp. All hazardous materials i.e. fuel, polyethylene liners, etc. shall be stored in an appointed area that is fenced off and has restricted access. | | ✓ | | | CONTRACTOR | Continuous | |
| c) Camp location | No temporary laydown areas or site offices, etc. may be established within the 'high sensitive' areas as demarcated in the report and study. | | ✓ | | | CONTRACTOR | Once-off | |
| d) Rehabilitation of camp | The area where the camp was established must after the construction period be rehabilitated to guidelines in this document or as otherwise | | ✓ | | | CONTRACTOR, VEGETATION | Once-off | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
|---|---|---|---|---|---|---|---|---|
| | | DS | CO | OP | DE | | | |
| | directed by the ECO. | | | | | SPECIALIST, ECO | | |
| **14.17 Environmental Awareness Training** | | | | | | | | |
| a) Training programme | An environmental awareness-training programme must be organized as part of the EMPr to ensure that each employee knows his/her responsibilities regarding the EMPr and the environment in general. Attendance certificates must be issued. Additional training as required, i.e. encounters with Red Data or other fauna should be arranged and provided. | ✓ | ✓ | | | CONTRACTOR, ECO | Once-off | |
| b) Appropriate activities | The employees, construction workers and maintenance crews will receive instruction in the appropriate activities that could take place among the natural resources of the area. | | ✓ | | | ECO | Once-off | |
| **14.18 Rehabilitation** | | | | | | | | |
| a) Compacted areas | All compacted areas (including backfilled trenches) should be ripped prior to them being rehabilitated. | | ✓ | | | CONTRACTOR | Continuous | |
| b) Reseeding | Stored topsoil and reseeding must be used to rehabilitate all open soil areas following construction activities. Any proclaimed weed or alien invader plants shall be cleared by hand before seeding. All rehabilitated areas must be maintained and irrigated as required to ensure sufficient vegetation coverage. Re-seeding may be required if sufficient coverage has not been achieved after 6 months and shall be at the Contractor' expense. | | ✓ | | | CONTRACTOR | Once-off | |
| c) Timeframe | Rehabilitation is to be done immediately after the involved works are completed. | | ✓ | | | CONTRACTOR | Once-off | |
| d) Rehabilitation by Sub-contractors | The Contractor is responsible for the actions and works of the sub-contractors and is required to complete the rehabilitation work if the sub-contractor fails to do so. Payment may be withheld from the sub- | | ✓ | | | CONTRACTOR | Continuous | |

| Possible Impact | Mitigation measures | Applicable phases | | | | Responsible Person | Frequency | Compliant |
|---|---|---|---|---|---|---|---|---|
| | | DS | CO | OP | DE | | | |
| | contractor in the event that the work must be completed by the main contractor. | | | | | | | |
| e) Completion of work | On completion of works, the contractor shall clear away and remove from the site all surplus materials, and other fixtures, rubbish and temporary works of every kind. Areas thus cleared shall be graded and scarified to restore the ground to its original profile as near as practicable before topsoil placement. | | ✓ | | | CONTRACTOR | Once-off | |
| **14.19 Advertising - not required for this project** | | | | | | | | |
| **14.20 Penalties** | | | | | | | | |
| a) Payment of penalties | To prevent the contravention of the requirements of EMPr spot fines or penalties may be implemented in consultation with the CM. | ✓ | ✓ | ✓ | | CONTRACT MANAGER, CONTRACTOR, ECO | Continuous | |
| **14.21 Emergency response and contingency plan** | | | | | | | | |
| a) Design of plan | To limit the extent of environmental damage | | ✓ | ✓ | | CONTRACT MANAGER, CONTRACTOR, ECO | Continuous | |

APPENDIX A

## UNDERTAKING BY DEVELOPER TO IMPLEMENT THE EMPR

### Undertaking by the Developer

I, ……, acting on behalf of …..…….. (the Developer), hereby indicate that I have read through the Environmental Management Programme and understand the measures required to be implemented in terms of the EMPr. I hereby undertake to implement these measures and carry out my duties as specified herein.

Signed on at …… on ……..……..(date)

Contractor's Environmental Representative Signature ……..

Witness……..

Witness……..

APPENDIX B

## UNDERTAKING BY THE CONTRACTOR

I, ……, acting on behalf of …….. (the Contractor), hereby indicate that I have read through the Environmental Management Programme and understand the measures required to be implemented in terms of the EMPr. I hereby undertake to implement these measures and carry out my duties as specified herein.

Signed on at …… on ……..……..(date)

Contractor's Environmental Representative Signature ……..

Witness……..

Witness……..

APPENDIX C

## UNDERTAKING BY THE ENVIRONMENTAL CONTROL OFFICER

I, ……, the Environmental Control Officer appointed by ……., hereby indicate that I have read through the Environmental Management Programme, and understand the measures required to be implemented in terms of the EMPr and hereby undertake to fulfil my duties as specified herein.

Signed on at …… on ……..……..(date)

Environmental Control Officer Signature ……..

Witness……..

Witness……..

APPENDIX D

## ABBREVIATIONS AND DEFINITIONS

| | |
|---|---|
| **CE** | Consulting Engineer |
| **CO** | Construction |
| **DE** | Demolition |
| **DS** | Design |
| **DWS** | The Department of Water and Sanitation – both national office and their various regional offices, which are divided across the country on the basis of water catchment areas. |
| **ECA** | Environment Conservation Act (Act 73 of 1989) |
| **ECO** | Environmental Control Officer |
| **EIA** | An Environmental Impact Assessment as contemplated in Sections 21, 22 and 26 of the Environment Conservation Act |
| **EMI** | Environmental Monitoring Inspector – from Provincial Government (E.g. GDARD) |
| **EMPr** | Environmental Management Programme |
| **FAUNA** | All living biological creatures, usually capable of motion, including insects and predominantly of protein-based consistency. |
| **FENCE** | A physical barrier in the form of posts and barbed wire or any other concrete construction, ("palisade"- type fencing included), constructed with the purpose of keeping humans and animals within or out of defined boundaries. |
| **FLOOD LINE** | The line or mark to which a flood could rise, every 50 (1:50 year flood line), or 100 (1:100 year flood line) years |
| **FLORA** | All living plants, grasses, shrubs, trees, etc., usually incapable of easy natural motion and capable of photosynthesis. |
| **FLORA** | All living plants, grasses, shrubs, trees, etc., usually incapable of easy natural motion and capable of photosynthesis. |
| **IEM** | Integrated Environmental Management |
| **MPRDA** | The Mineral and Petroleum Resources Development (Act 28 of 2002) |
| **NEMA** | National Environmental Management Act (Act 107 of 1998) |
| **NHRA** | National Heritage Resources Act (Act 25 of 1999) |
| **NWA** | National Water Act (Act 36 of 1998) |
| **OP** | Operational |
| **PENALTY** | A fine against the contractor by the PM as per request from the ECO. This could also be used for the benefit of the labourers (such as a camp braai). |
| **SABS** | South African Bureau of Standards |
| **SAHRA** | South African Heritage Resource Agency |
| **SAMOAC** | South African Manual for Outdoor Advertising Control |
| **SPOTFINE** | A fine against a labourer by the PM as per request from the ECO. This fine should be used for the labourers' benefit. |
| **SWALE** | A depression between slopes that provides for drainage |
| **TLB** | Tractor, Load & Backhoe |
| **TOPSOIL** | The layer of soil covering the earth which-<br>(a) provides a suitable environment for the germination of seed;<br>(b) allows the penetration of water;<br>(c) is a source of micro-organisms, plant nutrients and in some cases seed; and<br>(d) is not of a depth of more than 0,5 metres or such depth as the Minister may prescribe for a specific prospecting or exploration area or mining area. |
| **VEGETATION** | Any and all forms of plants, see also Fauna |

**WETLAND** A wetland is defined as land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998).