

OMEGA SUBSTATION EMP FOR CONSTRUCTION

JUNE 2007

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1. BACKGROUND

This Environmental Management Plan (EMP) has been drafted as a condition of the authorization granted by the National Department of Environmental Affairs and Tourism for the construction of the Omega Electrical Substation near Koeberg, Western Cape.

This Environmental Management Plan (EMP) has been compiled as a guideline for the mitigation and management measures to be implemented to avoid, reduce and minimise potential environmental impacts arising out of the construction of the substation.

It has been developed to ensure compliance with Department of Environmental Affairs and Tourism (DEAT) and the Eastern Cape Department of Economic Affairs Environment and Tourism (EC DEAET) regulations, and incorporates provisions contained within DEAT's Record of Decision (see Appendix A).

Although this is a management plan and not a specification, this EMP is a legally-binding document.

1.2 Purpose & Scope of the EMP

The EMP sets out general environmental requirements, which are applicable to the construction of the Omega substation. This document serves as a guideline for the management of the site and provides specifications and regulations that must in all instances be adhered to. It is the responsibility of the contractor and his staff / subcontractors to commit themselves to the implementation of this EMP during the construction phase of the project.

The objectives of the EMP are to:

- Ensure that all pertinent concerns of the key stakeholders and Interested and Affected Parties (I&APs) are addressed;
- Ensure that the activity is undertaken in compliance with national, provincial and local environmental legislation;
- Determine environmental conditions and sensitivities of the site and surrounding areas which may be impacted on by the activity,
- Determine mitigation measures and methods for assessing the success or failure of each measure;
- Provide a framework for environmental reporting throughout the construction phase.

1.3 EMP Format

The EMP is activity-based and has been set up in a table in order that it may be used as a checklist.

Certain principles of environmental best practice (for example dust and noise suppression) are relevant to many activities and should be borne in mind throughout the project process. These can thus be found at the end of the EMP in the section entitled "*GENERAL IMPACT MITIGATION MEASURES*" (Section 5).

1.4 Project Description

The construction phase for the substation will take up to three years and will include the construction of access roads to the substation, which will remain once construction is finished as part of the substation's permanent infrastructure. The civil construction works i.e. roads, platforming, stormwater control and foundations is likely to take in the region of twelve months, with the balance of time taken up with the fabrication and erection of steelwork. The construction phase will entail the following:

- Construction of the access roads to the substation
- Removal of all vegetation within substation footprint
- Terracing and levelling of the site
- Installation of foundations for infrastructure such as transformers, control building and radio tower
- Construction of bunds and oil holding dams (for emergency holding of transformer oil in the event of a spill) and fire safety walls
- Compaction and filling with gravel of the areas between the foundations
- Creation of formal drainage and stormwater control measures
- Delivery and installation of transformers, towers, busbars and associated infrastructure
- Construction of control rooms and administrative infrastructure
- Redirecting of existing 400kV lines to enter and leave the new substation
- Connection of the new infrastructure to the existing 400kV network
- Construction of perimeter fencing and lighting

1.5 Responsibility with Respect to the EMP

The principal contractor, any other contractors and sub-contractors will be required to comply with the provisions contained herein, and accordingly, the EMP and its provisions must form part of any contractual arrangements between Eskom Transmission and contractors.

2. GENERAL ENVIRONMENTAL SPECIFICATIONS

2.1 Environmental Control Officer

During the construction phase of the project, Eskom Transmission shall appoint an independent Environmental Control Officer (ECO) who must be a suitably qualified environmental consultant who will monitor compliance with the EMP by Eskom Transmission and all contractors.

The ECO's other responsibilities will include:

- Liasing regularly with regulatory government authorities, as required;
- Delivering environmental education and awareness training, as required;
- Providing technical assistance on environmental matters to employees; and
- Inspecting all activities to ensure compliance with conditions RoD and EMP.

2.2 Environmental Officer

During the construction phase of the project, the principal contractor shall appoint an Environmental Officer (EO), who will preferably be a senior member of staff that will be responsible to oversee day to day compliance with the EMP by the contractor's staff and sub-contractors and their staff.

The responsibilities of the EO will include:

- Issue instructions to rectify non-compliance;
- Conduct regular inspection meetings with the ECO to report on compliance; and
- Report non-compliance to the ECO.

2.3 Targets & Objectives

Detailed environmental objectives and targets must be set to meet the commitments of the environmental specifications included in the EMP, all legal obligations, and requirements included in the Record of Decision (RoD).

2.4 Legal Compliance

Eskom Transmission shall identify and comply with all relevant national, provincial and local legislation, including associated regulations and shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

2.5 Environmental Awareness Training

The principal contractor, and all other contractors employed on site, shall ensure that all its employees are adequately trained with regard to the implementation of the EMP and environmental legal requirements and obligations. See Section 4.3 of the EMP below.

2.6 Public Communication and Liaison with Stakeholders and Interested & Affected Parties

Public participation was undertaken as part of the EIA process and links to the community have been established by the independent Environmental Consultant. These links must be maintained by Eskom Transmission and utilised to the mutual benefit of all parties. See Section 4.2 of the EMP below.

Please note that where this Environmental Management Plan conflicts with other specifications, the ECO and Engineer must be consulted and reach an agreement on the way forward.

3. DEFINITIONS

3.1 Assembly Area

Means any area used for the assembly of transmission infrastructure prior to its erection. Such assembly areas may be within the construction camp or elsewhere within the Working Area.

3.2 Botanical Specialist

For the purposes of this Management Plan, means Nick Helme of Nick Helme Botanical Surveys, or where he is unavailable, a suitable replacement identified by the Project Manager.

3.3 Cement Laden Water

Means water containing cement or concrete arising from the Contractor's activities.

3.4 Clearing

Means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified.

3.5 Construction Area

Means the area to which the Contractor is allowed access for the carrying out of the Works.

3.6 Contaminated Water

Means water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.

3.7 Environment

Means the surroundings within which human beings exist and these comprise of:

- (i) The land, water and atmosphere of the earth;
- (ii) Micro-organisms, plant and animal life;
- (iii) Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- (iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

3.8 Establishment Period

Means the period that commences from the time of actual planting or revegetation until at least six months after planting.

3.9 Flood Plain

Means the area encompassed by the 1:100 year flood line.

3.10 Hazardous Substance (or Potentially Hazardous Substance)

A substance governed by the Hazardous Substances Act as well as the Hazardous Chemical and Substances Regulations. In addition, any other substance that, in the reasonable opinion of the Project Manager, can have a deleterious effect on the environment will be regarded as a potentially hazardous substance.

3.11 Heritage Resource

As per the provisions of the National Heritage Resources Act (No 25 of 1999), means those heritage resources that are of cultural significance or other special value for present and future generations, and which are accordingly considered part of the national estate. In this regard, the national estate includes those items identified in terms of Section 2 of the Act.

3.12 Heritage Specialist

In this context, the heritage specialist refers to Tim Hart of UCT's Archaeology Unit, or a specialist suitably qualified to deal with the type of heritage resource discovered.

3.13 His

Means his or her, as applicable.

3.14 Maintenance Period

The period after the establishment period up to and until the end of the defects liability period, during which the contractor shall be responsible to maintain the vegetation. The maintenance period must last at least one growing season.

3.15 Method Statement

Is a written submission by the Contractor to the Engineer in response to the Specifications or to a request by the Engineer, setting out the plant (construction equipment), materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement. The Method Statement shall be in such detail that the Engineer is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

The Method Statement shall cover applicable details with regard to:

- Construction procedures;
- Materials and equipment to be used;
- Getting the equipment to and from Site;
- How the equipment/ materials will be moved while on Site;
- How and where materials will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Timing and location of activities;
- Compliance/ non-compliance with the Specifications; and
- Any other information deemed necessary by the Engineer.

3.16 Natural Vegetation

This refers to all existing species on the site, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on the site.

3.17 Oil Separator

A trap that separates oil from the water and prevents oil from being carried from the Works into watercourses and water bodies.

3.18 Pollution Incident

Any incident that may or has caused damage to or the contamination of the natural environment.

3.19 Reasonable

Means (unless the context indicates otherwise), reasonable in the opinion of the Engineer, after he has consulted with the independent ECO.

3.20 Settlement Ponds

These are ponds that retain water from the Works laden with sediment, suspended solids or other matter for a sufficient period for the sediment/ suspended solids/ matter to settle.

3.21 Sensitive Area

Any area that is denoted as sensitive by this EMP or by the Project Manager due to its particular attributes.

3.22 Silt Laden Water

Means water containing sand and silt arising from the Contractor's activities and/or as a result of natural run-off.

3.23 Site

This is the area in the possession of the Contractor for the construction of the Works. Where the area is not demarcated, it will include all adjacent areas, which are reasonably required for the activities for the Contractor, and approved for such use by the Engineer.

3.24 Slope

Slope refers to the inclination of a surface expressed as one unit of rise or fall for so many horizontal units.

3.25 Solid Waste

Means all solid waste, including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

3.26 Spoil

Spoil refers to excavated material which is unsuitable for use as material in the Works or is material which is surplus to the requirements of the Works.

3.27 Topsoil

This is defined as the top (up to 300 mm) layer of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

3.28 Watercourse

This refers to any river, stream and natural drainage channel whether carrying water or not.

3.29 Water Body

Means body containing any form of water and includes dams and wetlands, whether ephemeral or permanent.

3.30 Wetland

Wetland means any area that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the area is covered by shallow water. Specifically, an area is classified as a "wetland" if it meets at least one of the following criteria:

- i) The area predominantly supports hydrophytes, at least periodically;
- ii) The substrate(soil) is predominantly undrained hydric soil; and/ or
- iii) The substrate is non-soil, and is saturated with water or covered by shallow water at some time during the growing season.

3.31 Works

Means the Works to be executed in terms of the Contract and in accordance with this EMP.

3.32 Working Area

The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpile and laydown areas, assembly areas, batching areas, the construction corridor, all access routes and any additional areas to which the Project Manager permits access.

4. ACTIVITIES AND MITIGATORY MEASURES

4.1 Ensuring Compliance with RoD	<i>Checklist</i>
a) No work shall commence until permission is granted from the Environmental Advisor from Eskom Transmission.	
b) The Project Manager shall ensure that all conditions in the Record of Decision are fulfilled before the Contractor occupies the site. These conditions, as well as the recommendations of the Scoping Report, are contained in Appendix A.	

4.2 Establishing Channels Of Communication With Surrounding Residents / Landowners	
a) A notice is to be erected at the entrance to Groot Olifantskop farm (on the edge of the R307 Road) stating the Name and contact details of: <ul style="list-style-type: none"> - The Project - The Proponent - The Lead Contractor - The Environmental Control Officer 	
b) Letters are to be sent to all surrounding landowners informing them of the project timeframes and of how they can comment on any aspect of the construction process.	
c) A comment register for IAPs is to be lodged at the site office and surrounding landowners / residents are to be informed of its existence.	
d) The comment register is to contain duplicate pages in order that the ECO may remove copies of comments when he / she visits the site, and may include these in his / her reports to Eskom and DEAT.	
e) All IAP's should be notified in advance of any known potential risks associated with the construction site and the activities on it.	
f) Key IAPs such as those residing on neighbouring properties, are to be kept informed about any serious changes to the construction programme should these arise.	

4.3 Education of Site Staff on General and Environmental Conduct	
<i>4.3.1. Environmental Education and Awareness</i>	
a) The contractor shall ensure that all direct and sub-contracted site personnel have a basic level of environmental awareness training.	
b) The Contractor must submit a proposal for this training to the ECO for approval prior to moving onto site. Translators are to be used where necessary.	
c) Topics covered should include: <ul style="list-style-type: none"> - What is meant by "environment". - The importance of the surrounding areas in terms of archaeological resources - Why the environment needs to be protected and conserved. - How construction activities can impact on the environment. - What can be done to mitigate against such impacts. - Awareness of emergency and spills response provisions. - Social responsibility during construction. e.g. being considerate to local residents. 	
d) It is the Contractor's responsibility to provide the site foreman with no less than 1 hour's environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.	
e) The Engineer / Environmental Control Officer should be on hand to explain more difficult / technical issues and to answer questions.	
f) The use of pictures and real-life examples is encouraged as these tend to be more easily remembered.	
g) Use should be made of environmental awareness posters on site.	
h) Construction workers should be made aware that they are not to make excessive noise (e.g. shouting / hooting) near to the homestead on Groot Olifantskop or where the work front nears other existing occupied buildings such as the neighbouring dairy.	
i) The need for a "clean site" policy also needs to be explained to the construction workers.	

<p>4.3.2. <i>Awareness of the Contents of this EMP and Conditions of the Record of Decision</i></p> <p>a) The Environmental Control Officer (ECO) on site shall, in conjunction with the Contractor, ensure that all site staff are informed of the details of this document as well as the conditions of the Record of Decision (ROD) issued by the Department of Environmental Affairs and Tourism (DEAT).</p>	
<p>4.3.3. <i>Worker Conduct on Site</i></p> <p>a) A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules:</p> <ul style="list-style-type: none"> - No alcohol / drugs to be present on site. - No firearms allowed on site or in vehicles transporting staff to / from site, (unless used by security personnel). - Prevent excessive noise. - Prevent unsocial behaviour. - Bringing pets onto the site is forbidden. - No harvesting of firewood from the site or from the areas adjacent to it. - Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives. (e.g.: fires for cooking; the use of surrounding bush as a toilet facility are forbidden). - Trespassing on private / commercial properties adjoining the site is forbidden. - Workers are not allowed to enter the areas that have been fenced off to protect archaeological resources or no go areas - Driving under the influence of alcohol is prohibited. - Other than pre-approved security staff, no workers shall be permitted to live on site. - No hunting of domestic or wild animals or birds is permitted on or near the site. 	

<p>4.4 Transport of Equipment to the Site</p>	
<p>a) All equipment moved onto site or off site during a project is subject to the legal requirements as well as Eskom specifications for the transport of such equipment.</p>	
<p>b) All equipment transported shall be clearly labelled as to their potential hazards according to specifications.</p>	
<p>c) All the required safety labelling on the containers and trucks used shall be in place.</p>	

d) The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident and shall supply a method statement to that effect.	
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4.5 Fencing of the Site	
a) Fencing of the site must take place before any construction activities can commence. The fencing at this stage will comprise the inner perimeter fence of the substation and will remain as a permanent feature.	
b) Fencing is to be as per Eskom Transmission specification.	
c) All works shall be limited to the fenced area and the Contractor workforce shall refrain from venturing outside this area onto private property	
d) All Eskom gates shall be fitted with locks and be kept locked at all times during the construction phase, especially when works are stopped during weekends and holidays. All claims arising from gates left open shall be investigated and if at fault, settled in full by the contractor.	
e) If any existing fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing.	
f) Areas to be fenced are to be pointed out by the specialist archaeologist prior to any plant being moved to site, or any disturbance to the site.	
g) Fencing is to take the form a diamond mesh or bonnox fence with a minimum height of 1,8 m. Metal or wooden standards at 20 m centres, with three wooden droppers between the standards are to be used. A minimum of 3 plain wire strands shall be tensioned horizontally, the lowest strand being at a height of 500 mm above average ground level and the highest being at 1.2 m. Mesh or bonnox type fencing, of 1.2 m in height, shall be secured to the wire strands and posts.	
h) Danger tape should then be placed around the fence at eye level to ensure that it is highly visible to site staff. The placement and quality of the danger tape should be maintained throughout the construction period.	

4.6 Fencing of other "No Go Areas"	
a) Areas determined by the Engineer to be "No Go" areas are to be clearly fenced and marked prior to moving plant onto site.	

b) Fencing is to take the form a diamond mesh or bonnox fence with a minimum height of 1,8 m. Metal or wooden standards at 20 m centres, with three wooden droppers between the standards are to be used. A minimum of 3 plain wire strands shall be tensioned horizontally, the lowest strand being at a height of 500 mm above average ground level and the highest being at 1.2 m. Mesh or bonnox type fencing, of 1.2m in height, shall be secured to the wire strands and posts.	
c) Danger tape should then be placed around the fence at eye level to ensure that it is highly visible to site staff. The placement and quality of the danger tape should be maintained throughout the construction period.	

4.7 Protection of Heritage Resources	
a) Sensitive heritage resources are marked on the map in Appendix B. These are to be fenced off prior to commencement of construction as per the fencing specification in section 4.6.b above. (Note that as per the archaeologists report, Site GO7 is not seen as significant in any way, and its destruction will not result in any important loss of archaeological material.)	
b) No soil or rock is removed from these sites or from their immediate vicinities.	
c) The Groot Oliphantskop farmhouse and outbuildings have very high heritage significance. Staff are to be made aware that under no circumstances may they enter the farm yard or inflict any damage on these buildings.	

4.8 Protection of Vegetation	
a) In addition to the alien clearing guidelines set out in this EMP, All alien clearing should be done according to DWAF approved methodology.	
b) No heavy machinery should impact on remnant patches of natural vegetation.	
c) It is recommended that the small seasonal drainage line is rehabilitated. This is something which is to be decided that the design phase and must be clarified between the contractor and the Engineer at the construction commencement phase. Should the seasonal drainage line be rehabilitated, a qualified botanist should be consulted in this regard.	

4.9 Protection of Avi Fauna	
a) In order to minimise destruction of habitat and disturbance of birds all movement to the site and is to be restricted to its immediate surroundings.	
b) Chris van Rooyen of the Endangered Wildlife Trust (EWT) is to be contacted at the tender stage to ensure that bird anti-collision devices and other bird-friendly measures can be costed for by the contractor.	

c) At the stage where the highest substation infrastructure is to be erected, the EWT is again to be contacted to ensure that the most up to date anti collision and anti-electrocution devices are being used on the substation and on turn-in lines.	
d) Note that the wetland across the Old Mamre Road from the site is a "No Go" area from an avi-faunal and botanical perspective. Although not necessary to fence this area, it must be clear to all staff that staff, vehicles and plant are not allowed on any parts of the farm except the immediate work and access areas.	

4.10 Mitigation Of Visual Impacts	
a) Aside from the maintenance of an orderly and neat construction camp and site office are, and the minimisation of light pollution, most visual impact mitigatory measures are not relevant to the construction phase but rather to the design phase of the project.	

4.11 Establishment of Survey Points	
a) The number of roads or trails that are cut to provide temporary access for survey work must be minimised.	
b) Marking of survey points must be done with the Engineer's approval.	
c) Archaeological and ecological "No Go" areas must be avoided during survey operations. (See Appendix B.)	

4.12 Establishing Access to Site	
<i>4.12.1 Planning Access Routes</i>	
a) Access to the site is to follow that existing gravel road from the R307 Road to the Groot Olifantskop farmhouse, before turning off to the left. (See Appendix C - Site Plan). From this turning point, a new access road will need to be constructed. The existing farm road will need to be upgraded to accommodate the type of machinery required for the project.	
b) The location of all underground services and servitudes must be identified and confirmed.	
c) Archaeological and ecological "No-Go" areas (as indicated on the accompanying layout) must be taken into account when planning site access.	
d) The use of this access route must be discussed timeously with the tenant residing on Groot Olifantskop, and any other users of the farm road in question.	
e) Routes that are not to be used by Eskom staff / Contractors are to be clearly marked with a "No Entry" sign.	

4.12.2 Construction and Upgrading of Access / Haulage Roads											
a) All roads for access to various parts of the site must lead off the main farm road and must be planned and approved by the Engineer and ECO ahead of construction activities. No roads are to be created on an ad-hoc basis.											
b) Where possible, roads must follow natural contours to reduce stormwater erosion and must have as little cut and fill as possible.											
c) Topsoil is to be conserved while providing access to the site. By this, the top layer (nominally 150mm) of soil should be removed and stockpiled in a designated area.											
d) Stormwater control (See Appendix D for General Stormwater Control Principles), and wind screening should be undertaken to prevent soil loss from the site.											
e) Side tipping of spoil and excavated materials shall not be permitted – all spoil material shall be disposed of as directed by the Engineer.											
f) The existing farm road will need to be upgraded to accommodate the type of machinery required for the project. This is subject to engineers' specifications and is to make provision for drainage											
g) Road widths and the radii of curves are to be reduced to the minimum required.											
h) No trees / shrubs / groundcover in the path of access / haulage roads may be removed without the prior permission of the Engineer/ECO.											
i) Agreed turning areas for haulage vehicles are to be formalised and used by the Contractor. No turning manoeuvres other than at the designated places shall be permitted.											
j) Contractors shall construct formal drainage on all temporary haulage roads in the form of side drains and mitre drains to prevent erosion and point source discharge of run-off.											
k) Scour check walls must be constructed in the side drains as follows:											
<table border="1"> <thead> <tr> <th>Gradient of Road</th> <th>Scour Check Spacing</th> </tr> </thead> <tbody> <tr> <td><4%</td> <td>Not required</td> </tr> <tr> <td>5%</td> <td>20m</td> </tr> <tr> <td>8%</td> <td>10m</td> </tr> <tr> <td>10%</td> <td>5m</td> </tr> </tbody> </table>	Gradient of Road	Scour Check Spacing	<4%	Not required	5%	20m	8%	10m	10%	5m	
Gradient of Road	Scour Check Spacing										
<4%	Not required										
5%	20m										
8%	10m										
10%	5m										
l) Scour checks on access and haulage roads can be constructed from rocks available on site or using driven wooden pegs. Smaller rocks must be placed on the invert of side drain upstream and downstream of the scour checks.											

4.13 Fire Risk Management	
a) No open fires shall be allowed on site under any circumstance	
b) All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires.	
c) Unless all vegetation is cleared in the immediate vicinity of storage areas, a fire break as per the Engineer's specifications must be burnt around the storage area perimeter.	

4.14 Establishing Emergency Control Procedures	
a) Fire fighting equipment should be present on site at all times as per OHSA.	
b) The Contractor shall have operational fire-fighting equipment available on site, especially during the winter months.	
c) The Contractor / Regional staff shall be in possession of an emergency spill kit that must be complete and available at all times on site.	
d) With regard to spillages of hazardous or potentially hazardous substances, the following shall apply: <ul style="list-style-type: none"> – Smaller spills can be treated on site. – A specialist Contractor must be appointed for the bio-remediation of contaminated soil where the required remediation material is not available on site. – All spills of hazardous substances must be reported to the appointed to the ECO and Eskom Transmission's Environmental Advisor. 	
e) A method statement is required from the Contractors, tendering for the project, to show procedures for dealing with possible emergencies that can occur, such as fire and accidental leaks and spillages.	

4.15 Setting up Construction Camp	
<i>(Note: It is the recommendation of the Scoping Report that workers reside off-site during the construction of the substation. Only security personnel should be permitted to stay on the site overnight).</i>	
a) A method statement is required from the Contractor at tender stage that includes the layout of the camp, management of ablution facilities and wastewater management.	
b) All amenities shall be installed before the main workforce move onto site.	
c) Choice of site for the construction camp requires the Engineer's permission and must take into account location of local residents and / or ecologically sensitive areas, including flood zones and slip / unstable zones. A site plan must be submitted to the Engineer for approval.	
d) Topsoil is to be conserved while setting up the camp. By this, the top layer (nominally 150mm) of soil should be removed and stockpiled in a designated area	

e) The construction camp may not be situated on a floodplain or on slopes greater than 1:3.	
f) Stormwater control (See Appendix D for General Stormwater Control Principles), and wind screening should be undertaken to prevent soil loss from the site.	
g) Should platforming need to take place for the establishment of the construction camp, side tipping of spoil and excavated materials shall not be permitted – all spoil material shall be disposed of as directed by the Engineer.	
h) All amenities shall be installed before the main workforce move onto site.	
i) The construction camp is not intended for overnight accommodation of staff and is thus to be comprised of: <ul style="list-style-type: none"> - site office - ablution facilities - designated first aid area - eating areas - staff lockers and showers (connection to existing water mains to be arranged and discussed with tenant) - storage areas including separate storage areas for hazardous substances - batching plant - refuelling areas - maintenance areas - crushers 	
j) The construction camp is to be situated on land that will eventually need to be transformed i.e. within the substation boundary fence.	
k) The size of the construction camp should be minimised and the construction camp plan drawn up by the contractor and approved by the Engineer, must be adhered to. Any changes or extensions must first be approved by the Engineer.	
l) The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion.	

4.16 Establishment of Ablution Facilities	
a) On parts of the site where waterborne sewerage is not available, temporary chemical toilets must be provided and serviced by a company that has been approved by the Engineer. Such toilets must be available for all site staff, both at the camp site, and on site as agreed by the Engineer. Toilets should be no closer than 50m from any natural water bodies, including the seasonal drainage line that traverses the site.	
b) The construction of "long drop" toilets is forbidden.	
c) Under no circumstances may open areas or the surrounding bush be used as a toilet facility.	

4.17 Provision of Water Supply to the Site	
a) Water is planned to be obtained from the Groot Oliphantskop farmhouse and farm supply connections. This is to be discussed with the tenant and an agreement is to be obtained in writing.	
b) Should additional water supply at other parts of the site be required, or the Contractor is required to use water from a natural source, the contractor shall supply a method statement to that effect. Strict control shall be maintained and the ECO shall regularly inspect the abstraction point and methods used.	

4.18 Provision for Waste Disposal	
a) Bins and / or skips shall be provided at convenient intervals for disposal of waste within the construction camp.	
b) Bins should have liner bags for efficient control and safe disposal of waste	
c) Recycling and the provision of separate waste receptacles for different types of waste is to be encouraged.	
d) All site waste is to be removed to a registered landfill site on a regular basis. Waybills showing this are to be given to the ECO at each audit.	
e) Waste oil is to be caught and stored on site and then collected regularly by a used oil contractor such as the ROSE foundation. Contact no Tel: 021-448 7492, usedoil@iafrica.com	
f) All contaminated soil / yard stone shall be removed and be placed in sealed containers. Contaminated material can be taken to one central point where bio-remediation can be carried out. Should the contractor not be aware of a bio-remediation centre, he is to consult the ECO.	
g) Rubble from the construction process shall be removed from site and may under no circumstances be dumped into any natural drainage channels.	

4.19 Vegetation Clearing	
a) All trees that are to be retained are to be clearly indicated on a site plan and demarcated. Note that these will be outside the fenced area of the substation as for safety reasons no trees may remain within the substation boundary	
b) Trees to be demarcated shall be clearly marked under the supervision of the Engineer and / or ECO.	
c) Marking should be carried out using danger tape in sufficient quantities that it is clearly visible to all site staff.	
d) Marking must remain in place for the duration of the construction period. If damaged, the marking tape shall be repaired or replaced immediately	
e) All alien vegetation shall be eradicated from site.	
f) Indigenous vegetation that does not pose any risks to the operation of the substation upon completion of the contract should be retained for aesthetic purposes. The Engineer and ECO should consult in this regard and this vegetation should be clearly marked on the site plans.	
g) Eskom's guidelines regarding the use of herbicides (TRR/S91/032 must be adhered to. Application of herbicides shall be under the direct supervision of a qualified technician and all surplus herbicide must be disposed of in accordance with the supplier's specifications.	
h) Should the contractor responsible for vegetation clearing be using herbicides, he must be in possession of a valid herbicide applicators' licence.	

4.20 Establishment of Storage Areas	
<i>4.20.1 General Substances and Materials</i>	
a) Storage areas must be located taking into account prevailing winds, distance to water bodies and general on-site topography.	
b) Storage areas must be designated, demarcated and fenced	
c) Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	
d) Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by children / animals etc.	
e) Fire prevention facilities must be present at all storage facilities.	
f) If electrical equipment for the substation is stored on site a fire break will be required around the storage area.	
g) Topsoil is to be conserved while clearing space for storage areas.	
h) Obstruction to drivers' line of site due to stockpiles and stacked materials must be avoided, especially at intersections and sharp corners.	

<p>4.20.2 Hazardous Substances and Materials</p> <p>a) Definition of hazardous substances / materials are those that are potentially: poisonous, flammable, carcinogenic or toxic. Some examples of hazardous substances / materials:</p> <ul style="list-style-type: none"> - diesel, petroleum, oil, bituminous products - cement - solvent based paints - lubricants - explosives - drilling fluids - pesticides, herbicides - LPG 	
<p>a) Storage areas shall display the required safety signs depicting "No smoking", "No naked lights" and "Danger". Containers shall be clearly marked to indicate contents as well as safety requirements.</p>	
<p>b) The contractor shall supply a method statement for the storage of hazardous materials at tender stage.</p>	
<p>c) Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.</p>	
<p>d) Hazardous storage and refuelling areas must be bunded with an impermeable liner to protect groundwater quality. The Contractor shall submit a method statement to the Engineer for approval.</p>	
<p>e) Fuel tanks must meet relevant SABS specifications and be elevated so that leaks may be easily detected.</p>	
<p>f) Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.</p>	
<p>g) Flammable materials should be stored as far as possible from adjacent residents / businesses.</p>	
<p>h) No materials are to be stored in unstable or high-risk areas such as in floodplains or on steep slopes.</p>	

<p>4.21 Setting up of Batching Plant/s</p>	
<p>a) The Contractor shall supply a method statement with regard to concrete and batching plant set up and management.</p>	
<p>b) These sites shall be cleared of all excess material upon completion of the contract. Such areas shall be rehabilitated to the satisfaction of the ECO.</p>	
<p>c) Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.</p>	

4.22 Establishment and Management of Plant Parking, Washing and Maintenance Areas	
a) A designated, banded area is to be set aside for vehicle washing and maintenance. Materials caught in this banded area must be disposed of to a suitable waste site or as directed by the Engineer.	
b) Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and re-mediated to the satisfaction of the ECO.	
c) Provision should be made during set up for all polluted run off to be treated to the Engineer's approval before being discharged into the stormwater system. (This will be required for the duration of the project.)	

4.23 Vehicle / Plant Maintenance and Repair	
a) All repair and maintenance of plant and vehicles is to take place within a designated, banded workshop area, unless permission is given from the engineer to undertake emergency repairs at the work front. Should this be the case, drip trays are to be used to catch any oil or other hazardous substances that may be spilled during the repairs. This is to be disposed of as per agreement with the ECO. (It is recommended that waste oil is collected and stored until it can be collected by a used oil contractor such as the ROSE foundation).	
b) Used tyres, oil filters etc are to be disposed of at a registered landfill site and under no circumstances may these be buried on site.	
c) Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.	

4.24 Sourcing of Materials	
a) Materials must be sourced in a legal and sustainable way to prevent off-site environmental degradation.	
b) Contractors shall prepare a source statement indicating the sources of all materials (including topsoil, sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the Engineer for approval prior to commencement of any work.	
c) A signed document from the supplier of natural materials should be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation.	
d) Where materials are borrowed (mined), proof must be provided of authorisation to utilise these materials from the landowner / mineral rights owner and the Department of Minerals and Energy.	

4.25 Construction Of Platforms	
a) Topsoil is to be collected and retained for the purpose of re-use later to rehabilitate disturbed areas that are not to be covered by yard stone. Such areas include terrace embankments and areas outside the high voltage yards. By this, the top layer (nominally 150mm) of soil should be removed and stockpiled in a designated area.	
b) The retained topsoil should be stockpiled until such time as it can be spread evenly over areas to be rehabilitated. It should be kept free from alien invasive species both while it is stockpiled and once it is spread for revegetation.	
c) All sloped areas shall be re-vegetated using the prescribed grass mixture and stabilised as soon as possible to ensure proper rehabilitation is effected. Stabilisation can comprise design elements or vegetation as specified in the design to prevent erosion of steep embankments. This is especially important as it is expected that cut and fill embankments will be steeper than previous natural slopes.	
d) The ECO is to be made familiar with the contract design specifications for the platforms. Both the ECO and Engineer are to ensure that these are adhered to and implemented strictly.	
e) Stormwater control (See Appendix D for General Stormwater Control Principles), and wind screening should be undertaken to prevent soil loss from the site during the construction of platforms.	
f) Side tipping of spoil and excavated materials shall not be permitted – all spoil material shall be disposed of as directed by the Engineer. It is suggested that spoil material be used where possible to construct visual screening berms, and to rehabilitate the borrow pit that would have been opened for the project.	

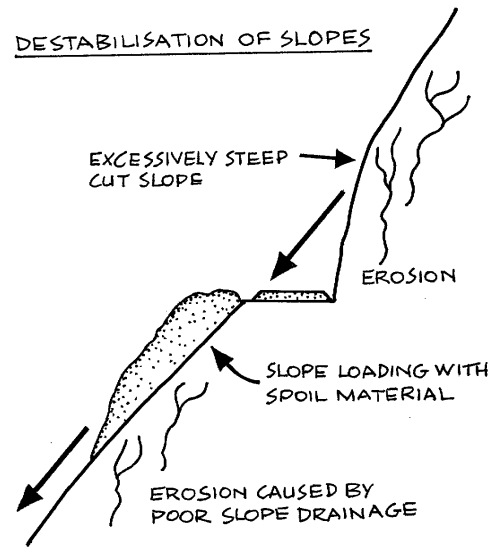


FIGURE 1: PROBLEMS CAUSED BY SIDE TIPPING

4.26 Disposal of Spoil Material	
a) It is proposed that excess soil is used to create berms around the northwestern portion of the site as per the Engineer's specification, to aid in mitigating visual impact.	
b) Additional spoil can be transported to the borrow pit which is proposed to be at the north eastern section of the site.	
c) Under no circumstances is spoil material to be disposed of on areas not approved by the Engineer and ECO.	
4.27 Implementation of sub-level stormwater controls	
a) A formal stormwater management plan is to be drawn up by the engineer and approved by the environmental authorities prior to the commencement of construction.	
b) The ECO is to receive a copy of this stormwater management plan in order that its implementation may be monitored.	
c) Please refer to Appendix D – General Stormwater Control Principles	

4.28 Revegetation of Platforms	
<p>a) Where revegetation is permitted (i.e. will not interfere with the workings of the substation), this is to take place as soon as possible to minimise stormwater and erosion problems.</p> <p>b) Where required re-vegetation can also be enhanced using a Renosterveld seed mixture that has been approved by the botanical specialist for the project, Nick Helme and that meets the following criteria:</p> <ul style="list-style-type: none"> - The mixture contains both annual and perennial species. - Pioneer species are included in the mixture. - Species chosen will grow in the area under natural conditions. - Root systems must have a binding effect on the soil. - The final product should not cause an ecological imbalance in the area. i.e. the grasses must not have the ability to spread in an invasive manner outside the substation boundary. 	

4.29 Construction Of Foundations For Infrastructure Such As Transformers, Control Building And Radio Tower	
<p>a) All foundations are to be constructed in accordance with the Engineer's specification.</p> <p>b) If concrete is mixed locally for these foundations, this shall be done on a hard impervious surface.</p> <p>c) All water shall be from a source approved by the Engineer.</p>	

4.30 Construction Of Bunds And Oil Holding Dams And Fire Safety Walls	
a) Oil bunds for the capture of overflow oil are to be constructed as per the engineer's specifications.	
b) These bunds are to be tested for leaks and to ensure that their capacity is adequate, prior to the transformers being filled with oil.	
c) Tests are to take place using water.	
d) Materials used for fire safety walls are as per Eskom specification.	

4.31 Compaction And Gravelling Of Areas Between Foundations	
a) This is to take place as per the Engineer's specifications.	
b) The time that areas are left open is to be minimised in order to mitigate against stormwater damage and erosion.	

4.32 Creation Of Formal Drainage And Stormwater Control Measures	
a) To prevent stormwater damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly.	

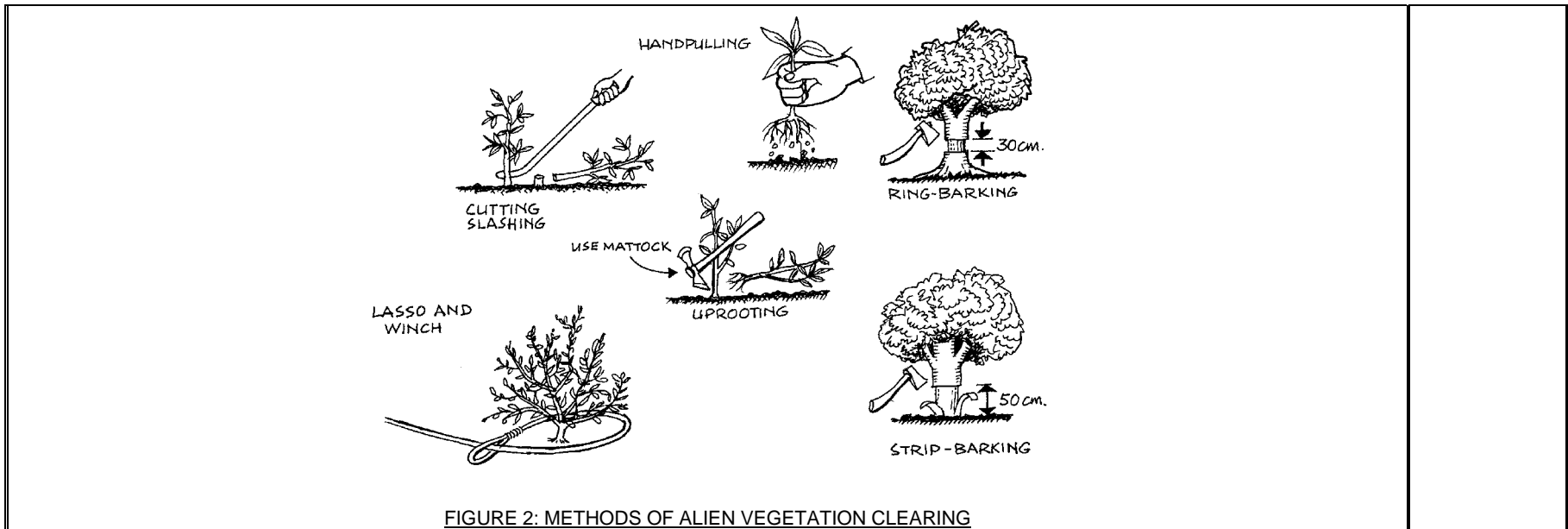
b) A formal stormwater management plan is to be drawn up by the engineer and approved by the environmental authorities prior to the commencement of construction.	
c) The ECO is to receive a copy of this stormwater management plan in order that its implementation may be monitored. Please refer to Appendix D – General Stormwater Control Principles	
c) Under no circumstances shall the contractor interfere with any watercourses in the vicinity of the site, unless these fall in the direct footprint of the substation and its yard	
d) Deviation of the seasonal drainage line (see site plan) is to take place under the guidance of the stormwater management plan and is to be monitored by the ECO and Engineer.	
e) The Environmental Control Officer shall ensure that all watercourses are adequately protected to prevent downstream siltation due to erosion on site.	
f) The normal flow of runoff water must not be impeded, as this will enhance erosion.	
g) Upgrading of the culvert at the north western end of the site (refer to Appendix C – Site Plan). Although this is external to the site is should form part of this EMP as it was flagged during scoping as being heavily impacted upon by the proposed substation.	
h) A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc).	
i) During site establishment, stormwater culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the Engineer. (e.g. due to demolition work).	
j) Temporary cut off drains and berms may be required to capture stormwater and promote infiltration.	

4.33 Traffic Management & Care of Road Infrastructure	
a) Construction – related traffic is to be restricted to daylight hours where practical.	
b) The Contractor will restrict deliveries of Heavy Goods Vehicles to daytime hours, except where otherwise agreed.	
c) All traffic accessing and leaving the site must adhere to official speed limits on national and district roads, and a maximum of 40 km/h on the plant site and access road.	
d) The Contractor shall liaise closely with the relevant traffic authorities regarding the scheduling and movement of 'abnormal vehicles' and must adhere to traffic authorities' procedures for 'abnormal vehicle' movement.	
e) Transportation of Hazardous substances needs to comply with the relevant legislative requirements (including the National Road Traffic Act (Act 93 of 1996)).	
f) Signage on roads and vehicles is to be clear and inform the public that the load is abnormal.	
g) The weight of the transformers is such that damage to roads is a possibility. Remediation of damage to farm road. As the EMP is site-specific, a detailed plan for remediation of damage to roads further afield is not given here. Contingencies for this should be negotiated well in advance between Eskom Transmission and the Provincial Roads department.	

4.34 Transformer Installation and Oil Filling of Transformers	
a) This is to take place in accordance with transformers according to SABS 780 standards as well as Eskom Transmission specifications.	
b) Oil bunds are to be operational and to have been fully tested by the oil-filling stage.	
c) Contingencies for the timeous disposal / reuse of spilt oil must be in place.	

4.35 Installation of Lighting	
c) Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents.	
d) The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to indigenous fauna, surrounding communities or other users of the area.	
e) Install light fixtures that provide precisely directed illumination to reduce light spillage beyond the immediate surrounds of the substation and avoid high pole top security lighting along the periphery of the site and use only security lights that are activated in legal entry to the site, wherever practicable.	

4.36 Alien Plant Control	
a) Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material).	
b) Immediate revegetation of stripped areas and removal of aliens by weeding must take place. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.	
c) Alien vegetation encroachment onto the site as a result of construction activities must be controlled during construction.	
d) As stated in the specialist botanical assessment for the project, alien vegetation clearing is to take place on sections of the farm that are outside of the development footprint, (specifically the area is southeast of the farmhouse, where natural Renosterveld occurs, but which is heavily invaded by alien vegetation).	
e) The contractor is to undertake this as well as follow up work to ensure that this area remains free from alien vegetation.	

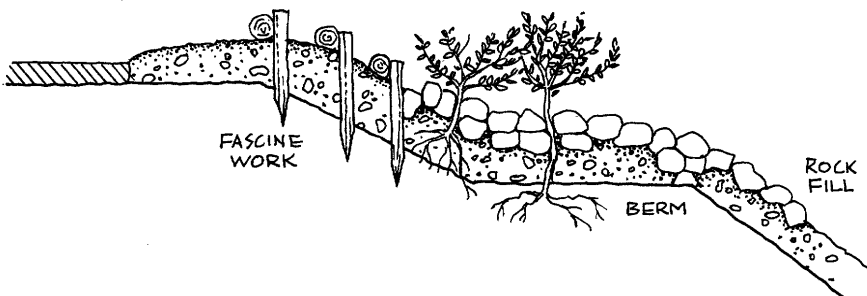


4.37 Decommissioning of Construction Camp and Site Office	
Upon project completion the ECO is to carry out a post construction audit to ensure that the following items have been complied with:	
a) All building rubble and waste has been removed from the site to an approved landfill site. Waybills to be provided.	
b) All unused building material has been removed from site.	
c) Stockpiles have been removed / spread according to the Engineer's instructions.	
d) Temporary services such as water and electricity have been removed / disconnected.	
e) The construction camp and site office footprint have been revegetated and / or gravelled to the Engineer's satisfaction.	
f) Signage has been removed from the site	

4.38 Reporting	
a) The ECO is to visit the site on a regular basis and supply bi-monthly reports to Eskom and the relevant environmental authorities.	
b) The Avi fauna and heritage specialists are to visit the site on a regular basis to ensure that sensitive areas are being adequately protected.	

5. GENERAL IMPACT MITIGATION MEASURES

5.1 Control of Dust/Air Pollution	
a) Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust.	
b) Areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust.	
a) The time that stripped areas are left open to exposure should be minimised wherever possible. Care should be taken to ensure that lead times are not excessive.	
c) The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements for overnight security staff. LPG gas cookers may be used provided that all safety regulations are followed.	

5.2 Soil Erosion	
a) The Contractor is to be aware that the stripping of vegetation during preliminary activities on site greatly increases the risk of erosion..	
b) Wind screening and stormwater control should be undertaken to prevent soil loss from the site.	
c) Procedures that are in place to conserve topsoil during the construction phase of the project are to be applied to the set up phase. i.e. topsoil is to be conserved while providing access to the site and setting up the camp.	
d) Battering of all banks shall be such that cut and fill embankments are no steeper than previous natural slopes unless otherwise permitted by the Engineer. Cut and fill embankments steeper than previous ground levels shall be revegetated immediately on completion of trimming or shall be protected against erosion using bio-engineered stabilisation measures as shown in figures 3 & 5. Deep-rooted vegetation such as Vetiver grass is effective to stabilise steeper embankments.	
	
<p>FIGURE 3: BIO-ENGINEERED STABILISATION METHOD</p>	

e) All embankments, unless otherwise directed by the Engineer, shall be protected by a cut off drain to prevent water from cascading down the face of the embankment and causing erosion.

INDIRECT IMPACTS: THE EXAMPLE OF LAND CLEARING

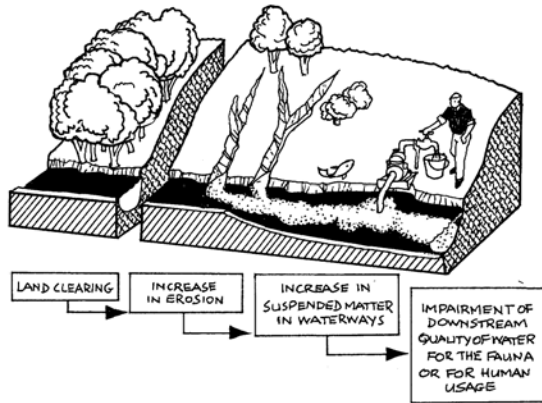


FIGURE 4: IMPACTS OF LAND CLEARING

EXAMPLES OF COMBINED TECHNIQUES FOR SLOPE PROTECTION

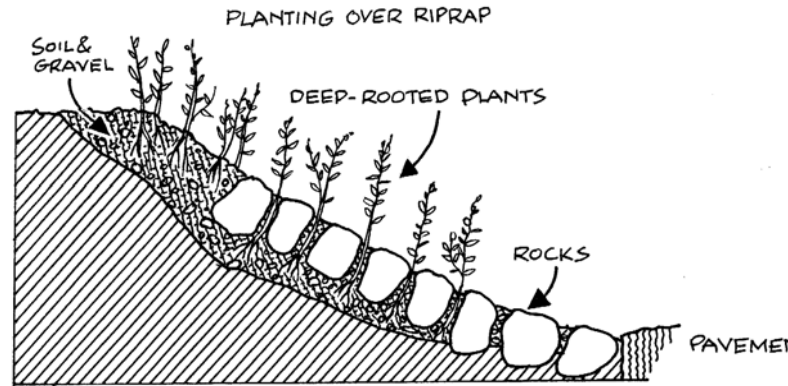


FIGURE 5: PROTECTION OF SLOPES AGAINST EROSION

5.3 Stormwater Control

5.3.1 General Stormwater Control Measures

- a) The Contractor shall not in any way modify nor damage the banks or bed of streams, rivers, wetlands, other open water bodies and drainage lines adjacent to or within the designated area, unless required as part of the construction project specification. Where such disturbance is unavoidable, modification of water bodies should be kept to a minimum in terms of:
- Removal of riparian vegetation
 - Opening up of the stream channel
- b) Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water pathways over the site. i.e.: these materials must not be placed in stormwater channels, drainage lines or rivers.
- c) There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed.
- d) The use of high velocity stormwater pipelines should be avoided in favour of open, high friction, semi-permeable channels wherever feasible.

e) A number of smaller stormwater outfall points should be constructed rather than a few large outfall points.

f) Stormwater outfalls should be designed to reduce flow velocity and avoid streambank and soil erosion.

B.6.2 Stormwater Detention Ponds

a) Detention ponds should be vegetated either with wetland vegetation or grass from the Revegetation Specification. The detention ponds must not block the water flow, but should encourage spreading of the flow over a wider area to reduce velocity and encourage infiltration.

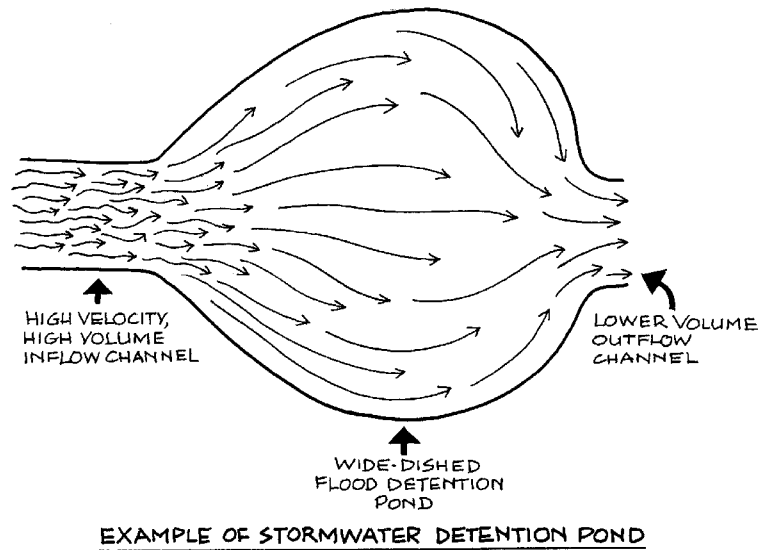


FIGURE 6: REDUCED FLOW VELOCITY DUE TO DISPERSAL BY DETENTION POND.

b) Peak stormwater discharge from the site / area should not be increased with development of the site / area. Stormwater should be detained on site through the use of stormwater detention ponds wherever possible. A series of detention ponds may be required where flow volumes are high.

B.6.3 Unchannelled Flow

a) During construction unchannelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw / hay or bundles of cut vegetation should be dug into the soil in contours to slow surface wash and capture eroded soil. The spacing between rows will be dependant on slope.

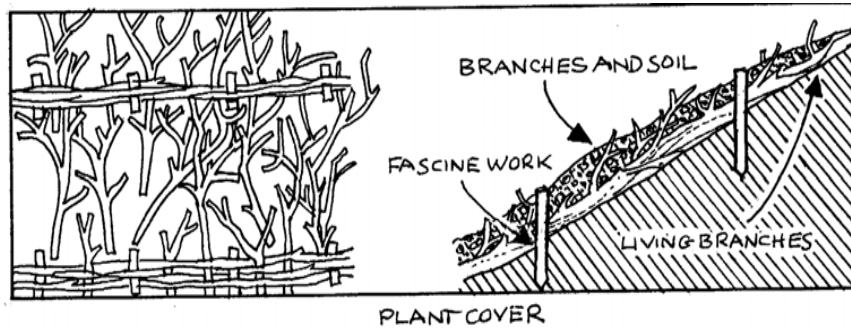


FIGURE 7: BRUSH PACKING OF PLANT MATERIAL TO GUARD AGAINST LOSS OF TOPSOIL DURING HEAVY RAINS.

- b) Where surface runoff is concentrated (e.g. along exposed roadways / tracks), flow should be slowed by contouring with hay bales or bundled vegetation generated during site clearance operation. If the area must be used for construction vehicles, berms may be used instead. The berms must be at least 30cm high and well compacted. The berms should channel concentrated flow into detention ponds or areas protected with hay bales for flow reduction and sediment capture.

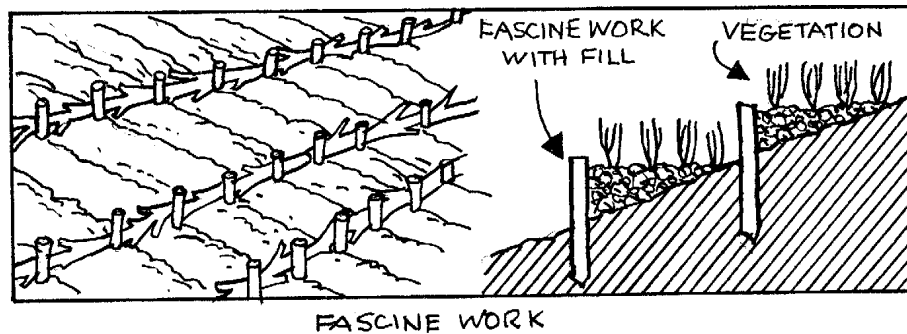


FIGURE 8: FASCINE WORK TO GUARD AGAINST EROSION AND WASHAWAYS.

5.4 Management of Noise Impacts	
<i>5.4.1 General Noise Minimisation</i>	
a) Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbours.	
b) Notice of particularly noisy activities must be given to residents / businesses adjacent to the construction site. Examples of these include: <ul style="list-style-type: none"> - noise generated by jackhammers - blasting - drilling - dewatering pumps 	
c) Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract.	
<i>5.4.2 Communication with Interested and Affected Parties (I&AP's)</i>	
a) The Engineer and Contractor are responsible for on-going communication with those people that are interested in / affected by the project.	
b) A complaints register should be housed at the site office. This should be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings.	
c) I&AP's need to be made aware of the existence of the complaints book and the methods of communication available to them.	
d) Queries and complaints are to be handled by: <ul style="list-style-type: none"> - documenting details of such communications - submitting these for inclusion in complaints register - bringing issues to Engineer's attention immediately - taking remedial action as per Engineer's instruction 	
e) Selected staff are to be made available for formal consultation with I&AP's in order to: <ul style="list-style-type: none"> - explain construction process - answer questions 	