



## **ENVIRONMENTAL MANAGEMENT PLAN**

Robben Island

### **DESCRIPTION**

This EMP relates to the mitigation measures to be used to minimise the consequences of the contract on the environment. The following philosophies and basic principles of environmental control and rehabilitation have been incorporated into the specifications:

- a) Any field or installation site is to be restored to as close to its original state wherever possible.
- b) Non-degradable material at the site shall be removed.
- c) No subsequent deterioration resulting from the works should take place.(e.g. Erosion or exotic vegetation).

### **ENVIRONMENTAL GUIDELINES, LEGISLATION AND STANDARDS**

Earthtech Geotechnical Services shall identify and comply with all South African national and provincial environmental legislation and any amendments thereof or any legislation enacted in substitution therefore or which repeals same, including associated regulations and all local by-laws relevant to the project. Key national and provincial environmental legislation that is currently applicable to the design, construction and implementation phases of the project that must be compiled with, are included in the following list. The list is intended to serve as a guideline only for Earthtech Geotechnical Services and is not exhaustive:

- Atmospheric Pollution Prevention Act, 1965 (Act No 45 of 1965).
- Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983).
- Environmental Conservation Act, 1989 (Act No 73 of 1989).
- Explosives Act, 1956 (Act No 26 of 1956).
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947).
- Forest Act, 1984 (Act No 122 of 1984).
- Hazardous Substances Act, 1973 (Act No 15 of 1973).
- Lake Areas Development Act, 1975 (Act No 34 of 1975).
- Land Survey Act, 1921 (Act No 9 of 1921).
- Minerals Act, 1991 (Act No 50 of 1991).
- National Environmental Management Act, 1998 (Act No 107 of 1998).
- National Forests Act, 1998 (No. 84 of 1998).
- National Heritage Resources Act, 1999 (Act No 25 of 1999).
- National Veld and Forest Fire Act, 1998 (Act No 101 of 1998).
- National Water Act, 1998 (Act No 36 of 1998).
- Occupational Health and Safety Act, 1993 (Act No 85 of 1993).



- Provincial and Local Government Ordinances and Bylaws.
- World Heritage Convention Act, 1999 (Act No 49 of 1999).

Earthtech Geotechnical Services shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

Where any legislation or regulations referred to in this EMP are repealed, amended or supplemented by any subsequent legislation or regulations which have been duly promulgated and have come into effect, the legislation thus referred to shall be deemed to have been repealed, amended or supplemented by the subsequent legislation or regulation in question, and shall be construed accordingly.

## **ENVIRONMENTAL MANAGEMENT PLAN**

The Environmental Management Plan (EMP) described below sets out environmental specifications to ensure a holistic approach to the management of environmental impacts during subsurface investigation projects.

The detailed Environmental Management Plan is a dynamic document subject to similar influences and changes as are wrought by variations to the provisions of the project specification. Any substantial changes to the EMP shall be submitted to the Engineer for approval before any work commences.

### Objectives of the EMP

The EMP has the following objectives:

- To specify the standards and guidelines that are required in terms of environmental legislation.
- To set out the mitigation measures and environmental requirements for all phases of the project in order to minimise the extent of environmental impacts, to manage environmental impacts and where possible, to improve the condition of the environment.
- To provide guidance regarding method statements which are required to comply with the environmental specifications.
- To define corrective actions to be carried out in the event of non-compliance with the specifications of this EMP.
- To prevent long-term or permanent environmental degradation.

### Legislative Framework

Earthtech Geotechnical Services has agreed to comply with the EMP and ensure compliance with the EMP by any third party appointed by Earthtech Geotechnical Services to fulfil its obligations within the terms and conditions set out in the Contract.



## Structure of the EMP

This EMP applies to work undertaken during subsurface investigations (should exemption be granted by national DEAT) and includes the following:

- Background information regarding this EMP document and the Employer.
- Definitions relevant to this EMP.
- The relevant environmental guidelines, legislation and standards.
- General environmental requirements for investigation works.
- General environmental requirements relating to the decommissioning of the site.
- The requirements for the appropriate management and control of environmental obligations.

## **ENVIRONMENT AND HEALTH TRAINING AND AWARENESS**

Earthtech Geotechnical Services shall ensure that its employees and any third party who carries out all or part of Earthtech Geotechnical Services' obligations under the Contract are adequately trained with regard to the implementation of the EMP, as well as regarding environmental legal requirements and obligations. All employees will have an induction presentation on environmental awareness.

Where possible, the presentation needs to be conducted in the language of the employees. The environmental training by Earthtech Geotechnical Services should, as a minimum, include the following:

- The importance of conformance with all environmental policies, procedures, plans and systems.
- Basic awareness and understanding of the key environmental features of the work site and environs.
- Understanding, and importance of, and the reasons why, the environment must be protected.
- Ways to minimise the environmental impacts.
- Requirements of the EMP.
- Risks and protection from dangerous wild animals, specifically crocodiles (if applicable).
- Prevention and handling of fire.
- Emergency procedures.
  
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.



- The importance of not littering.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites that may be unearthed during construction and the procedures to be followed should these be encountered.
- The procedures which should be followed should a grave be encountered or unearthed during the investigation.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the investigation.
- All works which may pose a hazard to humans and animals are to be adequately protected and appropriate warning signs erected.
- Earthtech Geotechnical Services shall provide adequate and operational fire safety equipment at all times. Personnel on-site shall be trained how to operate fire extinguishers etc.
- The use of construction vehicles shall be restricted to authorised personnel, and the speed limits adhered to at all times.
- Earthtech Geotechnical Services shall ensure that an HIV/AIDS awareness programme is implemented at the site camp. Weekly or monthly HIV/AIDS awareness topics should be identified which should be broadcast to all employees.

A training needs analysis shall be conducted by Earthtech Geotechnical Services to identify the appropriate environmental and health training requirements, and the appropriate target groups amongst the employees of Earthtech Geotechnical Services.

#### **NON-COMPLIANCE AND REMEDIAL ACTION**

Throughout the contract, the Engineer will monitor the ongoing EMP conformance by the Contractor and sub-contractors. The Engineer will consult with and report non-conformances with the EMP to Earthtech Geotechnical Services, with a copy of such report being given to each of Earthtech Geotechnical Services and the Employer. In any non-conformance report ("NCR") the Engineer must also stipulate the recommended corrective action to be taken to remedy such nonconformance.

Earthtech Geotechnical Services is deemed not to have complied with the EMP if, *inter alia*:

- There is evidence of contravention of the EMP specifications within the boundaries of the site, site extensions and access roads.
- There is contravention of the EMP specifications that relate to activities outside the boundaries of the site.
- Environmental damage ensues due to negligence.
- Contract activities take place outside the defined boundaries of the site.



- Earthtech Geotechnical Services fails to comply with corrective or other instructions issued by the Engineer within a specific time period.
- Littering on-site.
- Lighting of illegal fires on-site.
- Persistent or un-repaired oil leaks.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on-site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on-site.
- Urination and defecation anywhere except in designated areas

## **REMEDIAL ACTION**

Remedial action shall be managed by Earthtech Geotechnical Services in two categories:

### Specified Corrective Action

This constitutes remedial or mitigatory measures specified by the Engineer in any NCR, coupled with a specified time limit within which the specified corrective action must have been completed, at the expense of the party identified in the NCR as being responsible for carrying out the said work. The Engineer may on request and in the Engineer's sole discretion, grant an extension of time for the implementation of such corrective action. If the said corrective action has not been carried out within the period stipulated by the Engineer in the NCR, the non-conformance in question shall be dealt with as per b. hereunder.

### Formal Remedial Work

Where a non-conformance has resulted in environmental damage to the Site which cannot be rectified as per Engineer's specified corrective action or where Earthtech Geotechnical Services has failed to carry out any of the Engineer's specified corrective action within the prescribed time limit (or permitted extension thereof), the Engineer shall convene a meeting between representatives of the Employer and Earthtech Geotechnical Services, at which appropriate remedial work/mitigatory measures shall be discussed and agreed, and failing agreement within 10 days, such dispute shall be resolved in accordance with the dispute resolution provisions contained in the Contract, **including stopping all work on site.**

The Engineer shall issue an instruction to Earthtech Geotechnical Services to procure execution of the remedial work as agreed between the parties, and Earthtech Geotechnical Services shall be obliged to procure such remedial work within the prescribed period to the satisfaction of the Engineer. Failure by Earthtech Geotechnical Services to comply with an instruction from the Engineer to procure the carrying out of the required remedial work shall constitute a material breach of Contract, entitling the Employer to the applicable remedy provided for in the Contract. In particular, the Engineer shall be entitled to instruct



Earthtech Geotechnical Services to cease all work on site until the situation has been remedied.

### **EMERGENCY PREPAREDNESS**

Earthtech Geotechnical Services shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental veld or forest fires.
- Accidental spillage of hazardous substances.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Training plans, testing exercises and schedules for effectiveness.

Earthtech Geotechnical Services shall comply with the emergency preparedness and incident and accident reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

### **Incident reporting and remedy**

If a leakage or spillage of hazardous substances occurs on-site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- The location.
- The nature of the load.



- The status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

## **RECORD KEEPING**

### Administration

Before a general Construction Activity commences, Earthtech Geotechnical Services shall give to the Engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures (is required to be demonstrated).
- Treatment and continued maintenance of impacted environment.

Earthtech Geotechnical Services may provide such information in advance of any or all Construction Activities provided that new submissions shall be given to the Engineer whenever there is a change or variation to the original.

### Records to be kept

Earthtech Geotechnical Services shall ensure that a filing system identifying all documentation related to the EMP is established. A list of reports likely to be generated during the project is set out below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index:

- Environmental Management Plan.
- Final design documents and diagrams issued to and by Earthtech Geotechnical Services and any third party who carries out all or part of Earthtech Geotechnical Services' obligations under the Contract.
- All communications detailing changes of design/scope that may have environmental implications.



### Daily, weekly and monthly site monitoring reports

- Occupational Health and Safety reports.
- Complaints register.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Permits and legal documents, including letters authorising specific personnel of their duties as Occupational Health and Safety representatives or as part of emergency preparedness teams e.g. fire teams, etc.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- All method statements from Earthtech Geotechnical Services for all phases of the project.
- Weekly environmental report (regardless of whether there has been an incident)
- Copies of all toxic / hazardous waste dumping receipts.

### **ENVIRONMENTAL STANDARDS**

#### Legislation

All applicable environmental standards contained within the environmental legislation shall be adhered to. The following environmental guidelines and standards are highlighted. The list is intended to serve as a guideline only for Earthtech Geotechnical Services and is not exhaustive.

#### *River and stream crossings*

Any alteration of a stream or river (i.e. alteration of the course or river bed) requires a permit from the Department of Water Affairs and Forestry (DWAF) in terms of Sections 21, 36, 40 and 41 of the National Water Act, 1998 (Act No 36 of 1998).

Permission is required from the Department of Agriculture for the removal of river bank vegetation and disturbance of the river bank itself for all river crossings under the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983). All disturbances will have to be appropriately rehabilitated. It should be noted that pollution of the river water (siltladen run-off, oil from machines, etc.) is a contravention of the National Water Act, 1998 (Act No 36 of 1998) and is not permitted.

Wetlands are also protected under the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983), and under the National Water Act, 1998 (Act No 36 of 1998). Under the Conservation of Agricultural Resources Act, 1983, land users are forbidden to drain or cultivate any vlei areas without written permission. Under the National Water Act, 1998, no





land use shall utilise the vegetation in a vlei or flood area of a watercourse in a manner that may cause the damage or deterioration thereof.

#### *Abstraction of water*

A licence is required from the Minister of Water Affairs and Forestry for the abstraction of water where the abstraction exceeds the levels prescribed by general authorisation. If water is to be abstracted, it will be necessary to obtain a licence from DWAF in terms of Sections 21, 40 and 41 of the National Water Act, 1998 (Act No 36 of 1998). The limit varies from area to area. Under normal conditions, this limit will not be exceeded, but Earthtech Geotechnical Services is required to ensure that the amount abstracted is below the applicable limit.

#### *Heritage sites*

In terms of the National Heritage Resources Act, 1999 (Act No 25 of 1999), a permit is required for the disturbance, removal or destruction of any national and provincial heritage sites, archaeological and paleontological sites, burial grounds and graves and public monuments and memorials. The demolition or dismantling of all man-made structures (including bridges) and buildings older than 60 years is subject to the approval of the relevant provincial heritage council under the National Heritage Council Act, 1999 (Act No 11 of 1999).

If an artefact on-site is uncovered, work in the immediate vicinity shall be stopped immediately. Earthtech Geotechnical Services shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately inform the Engineer of such discovery. The South African Heritage Resources Agency (SAHRA) shall be contacted such that an archaeological/heritage resources consultant can be appointed to record the site and excavate if necessary. Work may only resume this area once clearance is given in writing by the archaeologist.

#### *Protected plants*

In terms of the National Forests Act, 1998 (Act No 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a permit.

#### *Waste disposal*

All wastes (general and hazardous) generated during the construction of the road may only be disposed of to appropriately licensed (in terms of Section 20 of the Environment Conservation Act, 1989; Act No 73 of 1989) sites. Cognisance must also be taken of the



relevant provincial legislation in this regard. It should also be noted that all controlling authority and regulations pertaining to litter in terms of the Environment Conservation Act, 1989 (sections 19, 19A and 24A), have been delegated to the provinces.

#### *Public health*

Soak-aways, french drains and other similar types of sewage effluent and human waste disposal facilities, are not permitted without the express approval of the Engineer and chemical toilets are required at all equipment units and at Earthtech Geotechnical Services's camp. If constructed, they must be approved by the nearest local authority in terms of their by-laws and relevant provincial standard by-laws.

#### Site plan

Before construction commences, Earthtech Geotechnical Services shall submit a site layout plan to the Engineer for approval (approval of the site and intended mitigation measures may not be unreasonably withheld), and shall include, inter alia:

- Site access (including entry and exit points).
  - Access and haulage routes.
  - All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals).
  - Construction offices and other structures (accommodation for staff, where required and considered appropriate).
  - Areas where construction vehicles will be serviced.
  - Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff.
  - Areas where vegetation will be cleared.
  - Solid waste collection facilities for litter, kitchen refuse, and for all non-hazardous solid waste including office and workshop waste.
  - Waste treatment facilities for sewage, grey water and workshop-derived effluents, where no formal facilities exist.
  - Storage and disposal sites for hazardous wastes
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- Provision of potable water and temporary ablution facilities.
  - Potential pollution hazards, and mechanisms to manage these.

Only designated areas may be used for the storage of materials, machinery, equipment, site offices and accommodation facilities. The site offices and accommodation units should not be sited in close proximity to steep areas, as this will increase the potential for soil erosion. Preferred locations would be areas of little relief. If the route traverses watercourses, streams and rivers, it is recommended that the offices (and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles) are located as



far away as possible from any watercourse, and downstream of water bodies. Regardless of the chosen site, Earthtech Geotechnical Services' intended mitigation measures shall be indicated on the plan and approved by the Engineer.

Throughout the period of construction, Earthtech Geotechnical Services shall restrict all activities to within the designated areas on the construction layout plan. Any relaxation or modification of the construction layout plan is to be approved by the Engineer. Detailed, colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the Engineer for consultation during rehabilitation of the site. The following restrictions or constraints should be placed on the site camp, and construction staff in general, and should be monitored by the Engineer:

- The use of rivers and streams for washing of clothes.
- The use of welding equipment, oxy-acetylene torches and other bare flames where veld fires constitute a hazard.
- Indiscriminate disposal of rubbish or construction wastes or rubble.
- Littering of the site.
- Spillage of potential pollutants, such as petroleum products.
- Collection of firewood.
- Poaching of any description.
- Latrining outside of the designated facilities.
- Burning of wastes and/or cleared vegetation.
- Hunting / poaching of animals.

#### Wastewater and sewage treatment

Earthtech will be making use of existing waste infrastructure on the island, as having a site toilet delivered to the site is not possible. Earthtech will adhere to all existing rules and regulations regarding waste that are in effect on the island currently.

#### Solid waste and litter

All refuse on-site shall be collected in drums and emptied at regular intervals. Separate containers shall be used for waste that can be recycled e.g. paper, cans and glass. These containers shall be taken to recycling centres. All other non-hazardous waste shall be taken to a registered waste disposal site.

No waste shall be burned at the site offices, or anywhere else on the site. Earthtech Geotechnical Services shall ensure that no waste is disposed of within quarries or borrow pits.



### Hazardous waste

Hazardous waste such as fuel, oils etc. shall be disposed of in a DWAF approved hazardous waste landfill site. Receipted proof of disposal of all hazardous waste shall be submitted to the Engineer.

Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery should be collected in a holding bin and returned to the supplier. Water and oil should be separated in an oil trap. Oils collected in this manner should be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit should be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. Earthtech Geotechnical Services shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances that can be harmful to an individual or the receiving environment. All used filter materials should be stored in a secure bin for disposal off site. Hazardous waste shall not be stored or stockpiled in any area other than that designated on the construction-site layout.

Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants should be collected and disposed of at a DWAF approved hazardous waste landfill site. Receipted proof of disposal of all hazardous waste shall be submitted to the Engineer.

### Cooking fuel

Earthtech Geotechnical Services shall provide adequate facilities for staff so that they are not encouraged to supplement their comforts on-site by accessing firewood or other flammable material from the natural surroundings. Earthtech Geotechnical Services shall ensure that adequate energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

### Fire

All staff are to be prohibited from making fires in non-designated areas. Earthtech Geotechnical Services shall ensure that we have all the necessary fire fighting equipment on-site. Earthtech Geotechnical Services is to ensure that we are aware of the requirements of landowners on the island.

### Flora and fauna

All undue interference with the natural flora and fauna is to be prohibited. Fauna and flora may only be disturbed to the extent that permission to do so has been obtained in terms of the applicable legislation. Should any indigenous vegetation unnecessarily or negligently be



disturbed or destroyed, Earthtech Geotechnical Services shall be liable for replacement costs of same

#### Access requirements

No access/haul roads other than those required for investigation purposes shall be developed. As far as possible, existing roads shall be used for access/haulage purposes. All new temporary access/haul roads shall be approved by the Engineer. See Section 6: Access. Access roads shall be constructed to and from the construction campsite. The measures outlined in Section 6.10 shall be followed for site clearance. Access roads shall be constructed with adequate drainage measures to allow for storm water to drain away from the road without causing erosion.

#### Hunting

Hunting is strictly prohibited on the island, including the use of traps and snares.

#### Construction water

Construction/Drilling/Mixing Water will be obtained from the sea if possible. If this is not possible, it will be obtained from a reliable, paid for source.

#### Materials handling, use and storage

Earthtech Geotechnical Services' management and maintenance of his plant and machinery will be strictly monitored according to the criteria provided below, regardless of whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop) or not.

#### *Safety*

All the necessary handling and safety equipment required for the safe use of petrochemicals and oils shall be provided by Earthtech Geotechnical Services to, and used or worn by the staff whose duty it is to manage and maintain the supplier's plant, machinery and equipment.

#### *Hazardous material storage*

Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry. Storage of bituminous products shall only take place using suitable containers approved by the Engineer. Earthtech Geotechnical Services shall provide proof to the Engineer that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the



stored materials shall be clearly displayed on the storage facility or containment structure. Before containment or storage facilities can be erected, the Contractor shall furnish the Engineer with details of the preventative measures that are proposed to be installed in order to mitigate against pollution of the surrounding environment from leaks or spillages. The preferred method shall be a concrete floor that is bunded. The proposals shall also indicate the emergency procedures to be implemented in the event of misuse or spillage of substances that will negatively impact on an individual or the environment.

#### *Fuels and gas storage*

Fuel shall be stored in a secure area in a steel fuel container. Leakage of fuel should be avoided and, if found to occur, should be remedied immediately. An adequate bund wall (110% volume) should be provided for fuel and diesel areas to accommodate any spillage or overflow of these substances.

#### Soil management

Earthtech Geotechnical Services shall ensure that minimal amounts of topsoil are lost due to erosion, either by wind or water. Earthtech Geotechnical Services shall be held responsible for the replacement, at his own cost, for any unnecessary loss of topsoil due to his failure to work according to the progress plan approved by the Engineer. Earthtech Geotechnical Services' responsibility shall also extend to the clearing of drainage or water systems that may have been affected by such negligence within and beyond the boundaries of the road reserve.

#### Weed and invader plant control

Earthtech Geotechnical Services shall remove all weeds and invader plants within the site affected by construction activities for the duration of the construction phase. Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act, 1983 or in terms of any other legislation. Removed vegetation must be disposed of at a DWAF approved waste disposal facility.

#### Spillages

Streams, rivers and dams should be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products. In the event of a spillage, Earthtech Geotechnical Services will be liable to arrange for competent entities to clear the affected area.

Responsibility for spill treatment lies with Earthtech Geotechnical Services. The individual responsible for, or who discovers a hazardous waste spill must report the incident to the



Engineer. The Engineer will assess the situation and act as required. In all cases, the immediate response shall be to contain the spill. The exact treatment of polluted soil/water shall be determined by the Engineer, in conjunction with a recognized expert. Areas cleared of hazardous waste shall be re-vegetated according to the Engineer instructions.

#### Preservation of indigenous plant material

Utmost care shall be taken to protect all indigenous plant material within the project. Should it be unavoidable, plant material may be temporarily removed and stored in a temporary nursery set up for this purpose. The nursery shall be properly managed to ensure the continued good health of all plants. It shall consist of sun as well as shade areas and each plant shall receive the required treatment as obtained in its natural surroundings. Should it be the opinion of the Engineer that Earthtech Geotechnical Services has failed to take sufficient care of the stored plant material and high plant mortality is experienced, the Engineer may require Earthtech Geotechnical Services to replace the lost plants at their own cost.

On completion of the section of road from which the plants were removed they shall be replanted in a similar situation, as near to their original position as possible. Although it may be possible to move most plants, some may be too large to survive the upheaval. These identified trees and shrubs may only be removed and discarded after authority has been obtained from the Engineer. The Engineer may not unreasonably withhold such authority.

#### Decommissioning of site

##### *Construction camp*

All offices, structures, machinery and equipment shall be removed from site. Fences and gates shall be removed. Power and water supplies shall be disconnected, unless otherwise instructed by the Engineer. Concrete foundations and buried pipes shall be removed. The site shall be scarified and topsoil from the stockpiles shall be placed over the area. The area shall be sown with an indigenous grass seed, either by hand seeding or by a system of hydro seeding (Appendix A if applicable). Advice on a suitable seed mix can be obtained from the Employer or the Department of Agriculture and Environmental Affairs. The area shall be maintained, watered and fertilized, until an adequate grass cover has become established to the Engineer's satisfaction. French drains shall be compacted and covered with a final layer of topsoil to a height of 100mm above the surrounding ground surface.

##### *Access roads*

Unless otherwise directed by the Engineer, all signs shall be removed.



### *Photographs*

Photographs of the construction campsite, access roads, test pits and drill sites are to be taken before and during construction operations and after rehabilitation of the site. The Contractor shall be responsible for taking photographs and keeping updated records.

### **ENVIRONMENTAL CONSIDERATIONS APPLYING SPECIFICALLY TO ROBBER ISLAND**

Earthtech Geotechnical Services' attention is drawn to the following specific environmental restraints ruling on the site:

No trees and shrubs may be removed/flattened in order to gain access to the site of a borehole and for working space, unless absolutely necessary. If, in the opinion of the Engineer, unnecessary damage has been done to the vegetation, the damaged vegetation shall be replanted at Earthtech Geotechnical Services' cost. The Engineer shall consider as "reasonable" an area of about 70m<sup>2</sup> as the working space for the rig and equipment. A "drip sheet" of plastic (not less than 500µ thick) shall be provided under the rig to catch all leaks or spillages.

Any soils contaminated with oil, fuel or drilling aids shall be loaded into drums and disposed of at the mainland hazardous waste site, at Earthtech Geotechnical Services' cost. Earthtech Geotechnical Services shall produce documentary proof of his compliance.

The Engineer has the right to stop the use of, or instruct the removal from site of any vehicle or equipment until such time as it has been repaired to his satisfaction, with particular regard to oil and fuel leaks.

Only biodegradable drilling aids may be employed on the site. Earthtech Geotechnical Services shall produce documentary proof to this effect PRIOR to commencing any drilling.

When removing core from the core barrel, this shall be done over a plastic sheet similar to that in 3 above, so that no drilling mud discharges onto the ground. Any mud on this sheet shall be carefully collected and returned to the drum sump.

Any fuel, oils, drilling aids stored on site shall be stored in a bunded enclosure and utmost care shall be taken when decanting these liquids to avoid spillages. Any soil contaminated by spillage shall immediately be removed, as detailed in 4 above.

Only one track may be employed to access a borehole. On completion of the drilling, the access track shall be rehabilitated (including replanting of vegetation, dumping of contour banks on steep slopes, etc) to the Engineer's satisfaction. If more than one track is created, it shall be reinstated to its former condition (including rehabilitation and replanting of vegetation, dumping of contour banks, etc, all to the satisfaction of both the Engineer and



the landowner), all at Earthtech Geotechnical Services' cost, including (if any) compensation to the landowner.

### GENERAL

A brief summary of all environmental considerations related to sections of the specifications with typical environmental impacts caused by, or resulting from, or causing damage to the environment are, listed in Table below.

Table 41.1 EMP CONSIDERATIONS RELATED TO SECTIONS OF THE STANDARD SPECIFICATION FOR SUBSURFACE INVESTIGATIONS

SECTION no.	OPERATION	Typical Environmental Impacts caused by/resulting from damage to/by														
		Vehicles (Erosion)	Tracks (Erosion)	Vegetation (Damage)	Excavations	Oil/fuel leaks	Sumps	Runoff	Drilling aids	Groundwater	Weeds	Waste	Toilets	Cooking	Fire	Grout spill
1	Establishment	x	x	x	x	x										
2	Housing	x	x	x	x	x		x			x	x	x	x	x	
3	Provision of rigs	x	x	x	x	x	x	x			x	x		x	x	
4	Setting out/ survey	x	x	x	x	x		x			x	x				
5	Setting up	x	x	x	x	x		x			x	x				
6	Access	x	x	x	x			x			x	x				
7	Crops	x	x	x	x						x				x	
8	Percussion drilling	x	x	x	x	x	x	x	x	x	x	x	x		x	x
9	Augering	x	x	x	x	x	x	x	x	x	x	x	x		x	x
10	Core drilling	x	x	x	x	x	x	x	x	x	x	x	x		x	x
11	Washboring	x	x	x	x	x	x	x	x	x	x	x	x		x	x
12	Core recovery	x	x													
13	Casing	x	x													
14	Drilling fluids								x	x						
15	Stabilisation grout									x						x
16	Disturbed samples	x	x	x	x			x			x					
17	Undisturbed sample	x	x	x	x			x			x					
18	Orientation surveys	x	x													
19	Core orientation															x
20	Integral core															x
21	DTH photography	x	x	x									x			
22	Vane shear			x	x											x
23	SPT															x
24	CPT	x	x													x
25	Water pressure tests	x	x							x						x
26	Grout acceptance	x	x													x
27	Piezometers	x	x													x
28	Inclinometers															x
29	Water rest levels															x
30	Core boxes			x												
31	Core sheds			x												
32	Core photos															
33	Transportation	x	x													
34	Marking of holes	x	x		x							x				x
35	Trenching	x	x	x	x	x		x		x	x					

### CONCLUSIONS

This EMP should be considered to be a dynamic document, and will be updated as required on a continuous basis and, as necessary, for individual projects.