ENVIRONMENTAL MANAGEMENT PROGRAMME

GALWAY ROAD CULVERT UPGRADE, EAST LONDON, BUFFALO CITY METROPOLITAN MUNICIPALITY.

DEDEAT REFERENCE: *EC/7/A/LN1/19/19-19*

Prepared for:

GIBB (Pty) Ltd.

Prepared by:

EAST LONDON
25 Tecoma Street, Berea
East London, 5201
043 726 7809

Also in Cape Town, Johannesburg, Port Elizabeth, Grahamstown and Maputo (Mozambique)

www.cesnet.co.za

JULY 2019

TABLE OF CONTENTS

1 INTRODUCTION

The proposed development entails the upgrading of the Galway Road culvert in Nahoon, East London within the Buffalo City Metropolitan Municipality, Eastern Cape. The proposed upgrade will include the demolition of the existing culvert and the construction of a new culvert to the left of the existing culvert location. The geographical location of the proposed culvert is approximately 32°59'26.97"S and 27°55'49.36"E.

Project Location and Description

The Buffalo City Metropolitan Municipality (BCMM) are proposing to upgrade the Galway Road culvert in Nahoon, East London within the Buffalo City Metropolitan Municipality. BCMM have appointed Gibb (Pty) Ltd as the implementing agent.

The proposed upgrade will include:

- The construction of a new culvert consisting of two 3m wide and 1.6m high portal culverts;
- The demolition of the existing culvert;
- The re-alignment of Galway road;
- Re-alignments of associated roads (i.e. Roslin and Mackenzie Roads) to accommodate for the increase in height of the new culvert and Galway road alignment; and
- The elimination of the right turning manoeuvre from Roslin road due to unsafe vehicle movement.

Figure 1.1: Location of the proposed new and existing Galway Road culvert.

Site Access

The proposed culvert can be accessed via Galway road, Nahoon, East London. The proposed new culvert structure will connect Galway road directly to Mackenzie road. The proposed culvert upgrade site is easily accessible and does not fall within privately owned land, the area is owned by the Municipality, BCMM.

1.1 Objectives of an EMPr

The EMPr has been compiled to provide recommendations and guidelines against which compliance monitoring can be done during the construction of the culvert, as well as to ensure that all relevant factors are considered to ensure for environmentally responsible development.

This EMPr informs all relevant parties [the Project Coordinator, the Contractor, the Environmental Control Officer (ECO) and all other staff employed by contractor at the site as to their duties in the fulfilment of the legal requirements for the construction, operation and decommissioning of the culvert with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation granted by the relevant environmental permitting authority.

The objectives of an EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- Verify environmental performance through information on impacts as they occur;
- Respond to unforeseen events;
- Provide feedback for continual improvement in environmental performance;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Identify measures that could optimize beneficial impacts;
- Create management structures that addresses the concerns and complaints of I&APs with regards to the development;
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity;
- Ensure that safety recommendations are complied with;
- Specify time periods within which the measures contemplated in the final environmental management programme must be implemented, where appropriate;

1.2 Form and function of an EMPr

An EMPr is focused on sound environmental management practices, which will be undertaken to minimise adverse impacts on the environment through the lifetime of a development. In addition, an EMPr identifies what measures will be in place or will be actioned to manage any incidents and emergencies that may occur during operation of the facility. As such the EMPr provides specifications that must be adhered to, in order to minimise adverse environmental impacts associated with the operations of the Facility.

The content of the EMPr is consistent with the requirements as set out in Regulation 33 of the EIA regulations stated below:

According to regulation 33 of GN R 543, an environmental management programme must include:

(a) Details of –

(i) The person who prepared the environmental management programme; and

(ii) The expertise of that person to prepare an environmental management programme;

(b) Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
  (i) Planning and design;
  (ii) Pre-construction and construction activities;
  (iii) Operation or undertaking of the activity;
  (iv) Rehabilitation of the environment; and
  (v) Closure, where relevant.
(c) A detailed description of the aspects of the activity that are covered by the draft environmental management programme;
(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);
(e) Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;
(f) As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;
(g) A description of the manner in which it intends to –
  (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
  (ii) Remedy the cause of pollution or degradation and migration of pollutants;
  (iii) Comply with any prescribed environmental management standards or practices;
  (iv) Comply with any applicable provisions of the Act regarding closure, where applicable;
  (v) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
(h) Time periods within which the measures contemplated in the draft environmental management programme must be implemented;
(i) The process for managing any environmental damage, pollution pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;
(j) An environmental awareness plan describing the manner in which –
  (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
  (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;
(k) Where appropriate, closure plans, including closure objectives.

1.3 Legal requirements

Construction must be undertaken in accordance with best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

The Contractor shall identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996

- Environment Conservation Act 73 of 1989
- National Environmental Management Act 107 of 1998
- National Environmental Management: Protected Areas Act 57 of 2003
- National Environmental Management: Biodiversity Act 10 of 2004
- National Forests Act 43 of 1983
- National Water Act 36 of 1998
- Conservation of Agricultural Resources Act 43 of 1983
- National Veld and Forest Fire Act 101 of 1998
- Hazardous Substances Act 15 of 1973
- National Heritage Resources Act 25 of 1999
- Atmospheric Pollution Prevention Act 45 of 1965
- National Environmental Management: Air Quality Act 39 of 2004
- National Environmental Management: Waste Management Act 59 of 2008
- Mineral and Petroleum Resources Development Act 28 of 2002
- Health Act 63 of 1977
- Occupational Health and Safety Act 85 of 1993
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity
- All relevant provincial legislation, Municipal by-laws and ordinances.

1.4 Environmental authorisation

In accordance with the requirements of the National Environmental Management Act (Act No 107 of 1998) (NEMA), and relevant EIA regulations made in terms of this Act and promulgated in August, 2010 (Government Notice R543), and listed activities under (Government Notice R 544, 545, 546), the proposed culvert construction was subjected to a Basic Assessment (BA).

In terms of the EIA process, all reports generated from the environmental studies form part of a series of documents for the project. The Basic Assessment Report (BAR) identified potentially significant environmental impacts and was the main report in the series. Additional Specialist Assessments served to supplement the assessment contained in the BAR.

This Environmental Management Programme (EMPr) interprets the findings of the BAR, and prescribes project-specific specifications to be achieved. In addition to the requirements of Regulation 33 of GNR 543, this EMPr is based on the principles of Integrated Environmental Management (IEM).

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT TEAM

According to regulation 33 of GN R 543, an environmental management programme must include:
(a) details of –
(i) the person who prepared the environmental management programme; and
(ii) the expertise of that person to prepare an environmental management

Environmental consulting company: CES
25 Tecoma Street, Berea East London, 5241
PO Box 8145, Nahoon, East London, 5210
Tel: (043) 726 7809
Fax: (043) 726 8352
e-mail: cesel@cesnet.co.za
www.cesnet.co.za

Coastal & Environmental Services (CES) was established in 1990 as a specialist environmental consulting company. Recently EOH Group of Companies acquired the shares in CES. EOH is the largest provider of enterprise applications, technology, outsourcing, cloud and managed services. The group is active in South Africa, Africa and the United Kingdom and has a strong Black Economic Empowerment profile. This integration will allow CES to combine EOH's great reach and reputation with CES's recognised excellence in environmental and social advisory services, thus maximising CES's strengths and comprehensive offerings in the environmental and social fields.

CES has considerable experience in terrestrial, marine and freshwater ecology, the Social Impact Assessment (SIA) process, and state of environment reporting (SOER), Integrated Waste Management Plans (IWMP), Spatial Development Frameworks (SDF), public participation, as well as the management and co-ordination of all aspects of the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) processes. CES has been active in all of the above fields, and in so doing have made a positive contribution towards environmental management and sustainable development in the Eastern Cape, South Africa and many other African countries.

Project team:
- Dr Alan Carter
- Mr Roy de Kock
- Ms Rebekah Anderson

Dr Alan Carter *(Project Leader)*
As Executive of the East London office, Alan has extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He is a member of the American Institute of Certified Public Accountants and holds a PhD in Plant Sciences. He is also a certified ISO14001 EMS auditor with the American National Standards Institute. Find full CV attached as Appendix 3.

Mr Roy De Kock (Report Review)
Roy is a Principle Consultant holding a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela University in Port Elizabeth. His MSc thesis focused on Rehabilitation Ecology using an open-cast mine as a case study. He has been working for EOH since 2010, and is based at the East London branch where he focuses on Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies. Roy has worked on numerous projects in South Africa, Mozambique and Malawi.

Ms Rebekah Anderson *(Report Writing & Mapping)*

Rebekah is an Environmental Consultant and holds a B.Sc. in Environmental Sciences from Nelson Mandela University, majoring with Botany and Geography. Rebekah has completed her B.Sc. honours in Environmental Management through UNISA. Her Honours Thesis aims to determine the sustainability of tourism activities within the Kwelera National Botanical Garden and the contribution of Botanical Gardens to sustainable tourism potential of the larger region. Rebekah has been with CES for just over a year, during which she was an intern for a period of 11 months. Rebekah has worked on a number of Impact Assessments and specialist studies during her time at CES. Her professional interests include Ecological assessment, Biodiversity, Sustainability Analysis and GIS mapping.

3 PROPOSED ACTIVITY

According to regulation 33 of GN R 543, an environmental management programme must include:

(c) A detailed description of the aspects of the activity that are covered by the draft environmental management programme;

3.1 Description of proposed activity

The current Basic Assessment Report relates to the following project:

The proposed development entails the upgrading of the Galway Road culvert in Nahoon, East London within the Buffalo City Metropolitan Municipality, Eastern Cape. The proposed upgrade will include the demolition of the existing culvert and the construction of a new culvert to the left of the existing culvert location. The geographical location of the proposed culvert is approximately 32°59'26.97"S and 27°55'49.36"E.

3.1.1 Site Location

The Buffalo City Metropolitan Municipality (BCMM) are proposing to to upgrade the Galway Road culvert in Nahoon, East London within the Buffalo City Metropolitan Municipality. BCMM have appointed Gibb (Pty) Ltd as the implementing agent.

The proposed upgrade will include:

- The construction of a new culvert consisting of two 3m wide and 1.6m high portal culverts;
- The demolition of the existing culvert;
- The re-alignment of Galway road;
- Re-alignments of associated roads (i.e. Roslin and Mackenzie Roads) to accommodate for the increase in height of the new culvert and Galway road alignment; and
- The elimination of the right turning manoeuvre from Roslin road due to unsafe vehicle movement.

Figure 1.1: Location of the proposed new and existing Galway Road culvert.

4 SCOPE OF THE EMPr

In order to ensure a holistic approach to the management of environmental impacts during the construction and operation of the proposed pedestrian culvert, this EMPr sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved.

The EMPr is a dynamic document subject to influences and changes as are wrought by variations to the provisions of the project specification.

4.1 Layout of the EMPr

The EMPr is divided into two phases of development. Each phase has specific issues unique to that period of the construction and operation of the road culvert and associated infrastructure. The impacts are identified and given a brief description. The two phases of the development are then identified as below:

4.1.1 Construction Phase

This section of the EMPr provides management principles for the construction phase of the project.

Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Project Coordinator and Environmental Control Officer.

4.1.2 Operational and maintenance phase

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required from municipalities during the operation and maintenance phase are specified.

5 ROLES AND RESPONSIBILITIES

According to regulation 33 of GN R 543, an environmental management programme must include:

(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);

5.1 Buffalo City Metropolitan Municipality (BCMM)

BCMM is the applicant and shall therefore be the entity monitoring the implementation of the EMPr and compliance with the authorisation. However, BCMM appoints a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf; the successful contractor's responsibilities are outlined in Section 5.2 that follows.

5.2 Contractor

The successful Contractor shall:

- Be responsible for the finalisation of the EMPr in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEDEAT;
- Be responsible for the overall implementation of the EMPr in accordance with the requirements of the environmental authorisation, if issued by DEDEAT;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Be responsible for obtaining any environmental permits which are required for the design, construction and operation of the Galway Road Culvert.
- Ensure that the appointments of the ECO and ESO are subject to the approval of BCMM.

5.3 Environmental Site Officer

The Contractor shall appoint a nominated representative of the contractor as the Environmental Site Officer (ESO) for the contract. The ESO will be site-based and shall be the responsible person for implementing the environmental provisions of the construction contract.

There shall be an approved ESO on the site at all times. It may be necessary to have more than one ESO.

The ESO's duties will include, inter alia, the following:

- Ensuring that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Reviewing and approving construction method statements with input from the ECO and Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.

- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the ECO and Contractor.
- The ESO shall submit regular written reports to the ECO, but not less frequently than once a month.

The ESO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- The ESO must be fully conversant with the Basic Assessment Report and Environmental Management Plan for the Galway Road Culvert and all relevant environmental legislation.
- The ESO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in bullet point one above.

The ECO shall be in the position to determine whether or not the ESO has adequately demonstrated his/her capabilities to carry out the tasks at hand and in a professional manner. The ECO shall therefore have the authority to instruct the contractor to replace the ESO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe. The ECO shall visit the development site and in addition to the responsibilities listed in section 5.4 below, review the performance of the ESO and submit regular performance reviews to BCMM, but not less frequently that once a month.

5.4 Environmental Control Officer

For the purposes of implementing the conditions contained herein, BCMM shall appoint an Environmental Control Officer (ECO) for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor where environmental considerations call for action to be taken. The ECO shall submit regular written reports to BCMM, but not less frequently than once a month.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the environmental authorisation by the Contractor. The ECO's duties in this regard will include, inter alia, the following:

- Confirming that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr, Environmental Authorisation and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.
- Reviewing and approving construction method statements with input from the ESO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr and environmental authorisation are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, Environmental Authorisation and Contract.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the EMPr and/or environmental authorisation.

- Undertaking a continual internal review of the EMPr and submitting any changes to BCMM and/or DEDEAT (in case of major changes) for review and approval.
- Checking the register of complaints kept on site and maintained by the ESO and ensuring that the correct actions are/were taken in response to these complaints.
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to BCMM.
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to DEDEAT, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by BCMM, prior to submission.
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the ESO as the ESO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO would need to check and ensure that the ESO understands the task at hand.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
    - Environmental Impact Assessment.
    - Environmental management plans/programmes.
    - Environmental auditing.
    - Mitigation and optimisation of impacts.
    - Monitoring and evaluation of impacts.
    - Environmental Management Systems.

The ECO must be fully conversant with the Environmental Impact Assessment, Environmental Management Plan/Programme, Environmental Authorisation (if issued) for the Galway Road Culvert and all relevant environmental legislation.

BCMM shall have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

6 MITIGATION AND/OR MANAGEMENT MEASURES

According to regulation 33 of GN R 543, an environmental management programme must include:

(b) information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
(i) planning and design;
(ii) pre-operations and operations activities;
(iii) operation or undertaking of the activity;
(iv) rehabilitation of the environment; and
(v) closure, where relevant.

(f) As far as reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally acceptable principle of sustainable development, including, where appropriate, concurrent or progressive or progressive rehabilitation measures;

(g) A description of the manner in which it intends to –
(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) remedy the cause of pollution or degradation and migration of pollutants;
(iii) comply with any prescribed environmental management standards or practices:
(iv) comply with any applicable provisions of the Act regarding closure where applicable;
(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(i) the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

A variety of potential impacts are associated with the planning and design phase, the construction phase and the operational phase of this project. This section focuses on the mitigation measures associated with each project phase in order to reduce negative impacts.

Issue	Mitigation measure
	Planning and Design Phase
Legal and policy compliance	• All relevant legislation and policy must be consulted and the proponent must ensure that the project is compliant with such legislation and policy. • These should include (but are not restricted to): NEMA, Eastern Cape Biodiversity Conservation Plan (ECBCP), Local Municipal bylaws. • All relevant permits and authorisations including Water Use Licences, Building Plan Approvals and plant removal permits must be in place prior to commencement of construction.
Site establishment	• The design of the construction site must ensure minimal impacts to the aquatic environment and residential houses surrounding the site. • The construction site must be demarcated and communicated with the contractor prior to commencement of construction. All No-Go areas must be clearly demarcated during the planning and design.
Stormwater management	• A Stormwater Management Plan must be developed by the Engineer or Contractor prior to construction to control runoff and prevent erosion of the site and its surroundings.

	• Appropriate stormwater structures alongside a stormwater management plan must be designed to minimise erosion of the surrounding environment and sedimentation of surrounding watercourses. • All infrastructure situated on slopes must incorporate stormwater diversions. • Flood attenuation and stormwater management plans must be drawn up by a qualified engineer. • Stormwater designs must be in line with DWS requirements.
Waste management	• An appropriate waste management plan for handling onsite general and hazardous waste during the construction phase must be developed and implemented.
Erosion and sedimentation **Altered hydrology and geomorphology of the watercourse** **Pollution of the watercourse**	• The design and layout of the proposed culvert must allow for the relevant soil stabilisation efforts to be implemented throughout duration of construction activities. • An Erosion Management Plan must be developed by the Engineer/Contractor during the final design stages to mitigate the unnecessary loss of soil and sedimentation of watercourses during all phases of the project. • The Erosion Management Plan must be approved by the appointed ECO. • Scour counter measures must be incorporated into the design of the culvert. • Adequate bank stabilisation measures must be incorporated into the design of the culvert. • All necessary Water Use Authorisations must be obtained for any of the following activities: ○ Construction within a watercourse. • Appropriate stormwater structures alongside a stormwater management plan must be designed to minimise erosion of the surrounding environment and sedimentation of surrounding watercourses.
Loss of aquatic fauna	• A search and rescue operation for aquatic fauna must be incorporated into the construction plans and performed by the relevant specialist prior to commencement of construction. • Any aquatic fauna found on site during construction must be immediately removed and reintroduced into undisturbed areas of the watercourse.
Natural vegetation **Floral biodiversity** **Species of Conservation Concern**	• During the planning and design phase, the construction footprint must be clearly demarcated and must be designed to avoid the loss of indigenous vegetation as far as possible. • During the planning and design phase, a site assessment by a qualified botanist must be conducted in order to identify any plant or animal SCC that may be affected by the development. • Planning for any search and rescue operations must be conducted prior to the commencement of construction activities.
Establishment of alien vegetation	• An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project. • The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation. • Regular monitoring of the implementation of this plan for the rehabilitation of disturbed areas must be conducted throughout construction and rehabilitation by the appointed ECO.

Health, safety and crime	• A health and safety plan in terms of the Occupational Health and Safety Act (Act No 85 of 1993) must be drawn up by and HSE officer prior to construction to ensure workers safety.
On-site fire risk	• An Emergency Preparedness Plan must be designed for the construction phase prior to construction commences and
Heritage and paleontological resources	• A qualified heritage assessment practitioner must do a survey of the site prior to construction to identify any heritage or paleontological resources. Should any other incidental heritage or paleontological resources be uncovered during construction, works must be stopped immediately, the appropriate heritage practitioner must be notified and undertake a site inspection. The heritage practitioner must compile a report and make recommendations for the way forward as well as the legal requirements
Inadequate rehabilitation and maintenance	• During the planning and design phase, a Rehabilitation Plan must be developed and implemented during construction. • Regular monitoring of implementation of this plan for the rehabilitation of disturbed areas must be conducted throughout the duration of the phase.
Construction phase	
Legal and policy compliance	• The Applicant must employ an independent Environmental Control Officer (ECO) for the duration of the construction phase to audit the contractors compliance with the specifications in the EA, EMPr and any other permits/authorisations.
Site establishment	• Construction must only take place within the demarcated construction footprint. • Any construction outside of the demarcated site must be approved by the ECO before construction in this area takes place. • The contractor must establish his construction camps, offices, workshops and any other infrastructure in previously impacted areas and in a manner that does not adversely affect the environment. • The contractor must submit (prior the commencement of construction) a method statement for site clearance for approval by the Project Coordinator in consultation with the ECO. • The Construction camp must have the necessary ablution facilities with chemical toilets at commencement of construction activities to the satisfaction of the Project Coordinator. Ablution facilities must be within 50m from workplaces but not closer than 50m from any natural water bodies or boreholes. There must be enough toilets available to accommodate the workforce. • Safe drinking water for human consumption must be available at the site offices and at other convenient locations on site. • No fires are allowed outside of the construction camp. Activities which may pose a risk of fire must be identified and suitable measures must be put in place to prevent any possible damage by fire. Firefighting equipment must be supplied by the Contractor at suitable locations. • The Contractor must supply waste collection bins where such is not available, and all solid waste collected must be disposed of at a municipal registered landfill (at Berlin). Under no circumstances may solid waste be burnt on site.
Bulk services and infrastructure	• Construction works and infrastructure must be kept within the demarcated construction footprint. • Regular monitoring of construction works and placement of the associated infrastructure for the Galway road culvert must be conducted by a qualified ECO throughout the duration of construction.
Material stockpiling	• Material stockpiles must be located 50m away from the watercourse.

	• and they must be monitored for erosion and alien vegetation. • Material stockpiles locations must be approved by the ECO.
Stormwater management	• A stormwater management plan must be developed in the planning and design phase and implemented throughout the duration of construction. • Berms and swathes must be placed in areas that may be prone to erosion. • Temporary cut-off drains and berms may be required to capture storm water and promote infiltration.
Waste management	• A Waste Management Plan for handling onsite waste during the construction phase must be developed and implemented. • All general waste must be disposed of in bins/waste skips labelled "general waste". • Sufficient waste bins must be provided throughout the construction site for collecting waste. • All general waste collected on site must be disposed of at a licensed general waste disposal site. • Construction rubble must be disposed of in demarcated spoil dumps that have been approved by BCMM. • Sufficient waste bins must be provided at the construction site for different types of waste disposal and for recycling purposes. • Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. • Littering by the employees of the Contractor must not be allowed under any circumstances. The ECO must monitor the neatness of the work sites as well as the Contractor campsite. • All waste must be removed from the site and transported to a landfill site as approved by the BCMM. • Adequate sanitary facilities must be provided for construction workers and they must be properly secured to the ground. • Maintenance of the chemical toilets should be done on a regular basis to prevent any leakages.
Hazardous substances	• Any storage tanks containing hazardous materials (ie fuel, diesel) must be placed in bunded containment areas with sealed surfaces and the capacity of the bunded containment areas must be 110% the volume of the storage tanks within it. • Cement and concrete must not be mixed directly on the ground, or during rainfall events when the potential for transport of pollutants to watercourses is the greatest. • Used cement bags should be collected and stored in containers to prevent wind-blown cement dust and water contamination. • Mixed cement/concrete must not be allowed to flow into any watercourses. • Drip trays must be placed under stationary construction machinery overnight to avoid soil contamination from oil and fuel leaks. • Absorbent materials in the form of a spill kit must be provided on site. • Contaminated soil must either be excavated or treated on-site, depending on the nature and extent of the spill. • The ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials or oil-digestive powders to the contaminated soil. • Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in suitable containers until appropriate disposal. • All hazardous waste generated on site must be placed in a temporary impermeable bunded containment area which must be disposed of at a hazardous landfill site or be collected by the appropriate service provider.

	• Proof of receipt of hazardous waste by a licenced service provider must be maintained on the site.
Erosion and sedimentation	• Erosion management plan must be implemented. • No construction material must be stored within the watercourse. • Stockpiles within 50 m of a watercourse must be monitored for erosion and mobilization of materials towards watercourses. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the nearest watercourse. • Remediation action must be taken at the first sign of any erosion; • Whilst working in the watercourse, temporary stabilization measures must be enforced to prevent exposed soils from undergoing erosion eg. silt traps; • After construction, all slopes must be stabilised (e.g. with stone gabions, netting, re-vegetation etc.) to reduce the risk of erosion;
Altered hydrology and geomorphology of the watercourse	• All left over materials used to construct the new culvert must be removed off site. Bank protection and/or stabilisation measures must be put in place and stop-boards used to control loose soil entering watercourses. • In addition, runoff from the construction areas must not be channelled directly into any of the watercourses. A concurrent rehabilitation plan will be required to redress the river bank areas which have been affected by the excavation and construction activities. • Material for gabions or similar structures must not be sourced from the river course. • During the construction phase coffer dams must not be left in place for longer than 30 days. • All work within the river must be completed during the dry season, when flows are at their lowest. • Water in the rivers must be allowed to pass downstream of the construction activity. If necessary this should be achieved via a temporary diversion – this must not be in place for more than 30 days.
Loss of aquatic fauna	• Any aquatic fauna found on site prior and during construction must be removed and reintroduced into undisturbed areas of the watercourse as approved by the ECO.
Loss of soil quality	• Stormwater control must be undertaken to prevent soil loss from the site. • The contractor must develop and implement an Erosion Management Plan. • All erosion control mechanisms must be regularly maintained. • Natural vegetation must be retained where possible to avoid soil erosion. • Construction must be phased in order to minimise the area of exposed soil at any one time. • Disturbed areas of natural vegetation must be rehabilitated immediately to prevent further soil erosion. • Fill and stabilise eroded river banks immediately after construction activity in the specific area commences.
Natural vegetation	• The construction footprint must be surveyed and demarcated prior to construction commencing. • No construction activities must occur outside the demarcated footprint. • Construction activities must be kept to a minimum where untransformed areas of natural vegetation occur. • Construction activities should preferable be located in degraded areas. • Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and vegetation must be undertaken.
Floral biodiversity	

	• Cleared vegetation must not be piled on top of natural vegetation but must be stockpiled temporarily on bare ground and removed to a registered landfill site. • It is not advised that cleared vegetation be mulched and used as ground cover during rehabilitation as most vegetation onsite consists of alien invasive plant species. • The contractor's staff must not harvest any natural vegetation. • All SCC impacted by construction activities must be conserved and rescued.
Species of Conservation Concern	• Should SCC be identified during construction, construction activities in the area containing the SCC must stop immediately and a search and rescue operation must be conducted by a qualified botanist. • All SCC impacted by construction activities must be conserved and rescued. • All rescued SCC must be transplanted to a suitable habitat or nursery for the duration of the construction phase; • All rescued SCC must be replanted within the site where it was originally found or in close proximity during rehabilitation
Loss/ fragmentation of habitats	• Vegetation clearance and aquatic habitats, beyond the construction footprint, must be avoided as far as possible; • Should avoidance be impractical, harm to the environment must be minimised.
Establishment of alien vegetation	• The approved Alien Vegetation Management Plan must be implemented during the construction phase to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting etc. as in accordance to the NEMBA: Alien Invasive Species Regulations.
Job creation	• Where possible construction resources must be purchased from local companies.
Traffic flow	• A traffic management plan must be implemented • The contractor must properly mark all access roads. Markers must show the direction of travel to which the road leads. Roads not to be used must be marked with a "NO ENTRY" sign. Where required, speed limits must be indicated on the roads. All speed limits must be strictly adhered to at all time.
Health and safety	• Environmental and safety inductions must be provided to all staff before they are permitted on the construction site. • Dangerous sites (e.g. open excavations) must be cordoned off and no public access allowed. • Contractors must have emergency telephone numbers on site. • A health and safety file is to be kept on site and all incidents must be recorded and reported to the designated safety officer by the contractor.
	• Speed limit and other road signage must be instituted as required. • Traffic calming measures must be implemented throughout the duration of the construction phase.
Sanitation	• Adequate sanitary and ablutions facilities must be provided for construction workers • The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.
Air quality and dust control	• During windy periods un-surfaced and un-vegetated areas must be dampened down. • Vegetation must be retained where possible as this will reduce dust travel.

	• Any complaints or claims emanating from dust issues must be attended to immediately and noted in the complaints register.
Visual	• All construction activity should take place during daylight working hours (i.e. 7 – 5pm). • All construction activity and equipment must be limited to the demarcated areas. • Good housekeeping must be maintained throughout the construction work areas to limit the visual intrusion of the construction activities.
Noise	• Activities which include the movement of construction vehicles and the operation of machinery should be restricted to normal working hours (07:00am – 17:00pm). • There must be a complaints register on site for nearby residents to make complaints. These must be addressed and recorded. • Construction site yards, workshops, and other noisy fixed facilities must be located well away from noise sensitive areas. • Heavy vehicle traffic must be routed away from noise sensitive areas, where possible. • Blasting operations (if required) are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting may be allowed at night. • Noisy activities must take place during allocated construction hours only as per section 25 of the Noise Control Regulations of the Environment Conservation Act, 1989 (Act No. 73 of 1989) • The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance.
On-site fire risk	In order to reduce the risk of fires: • All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. • Smoking must not be permitted near flammable substances. • No open fires must be allowed on site. • Fire extinguishers must be available onsite.

Environmental training	• Ensure that all site personnel have a basic level of environmental awareness training. Topics covered should include:
	  ○ What is meant by "Environment"
	  ○ 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 of the culvert e.g. being considerate to local residents
	• The need for a "clean site" policy also needs to be explained to the workers.

Social Environment	• A complaints register must be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings. • Where possible, unskilled job opportunities must be afforded to local community members.
Heritage and paleontological resources	• A qualified heritage assessment practitioner must do a survey of the site prior to construction to identify any heritage or paleontological resources. • Should any other incidental heritage or paleontological resources be uncovered during construction, works must be stopped immediately, the appropriate heritage practitioner must be notified and undertake a site inspection.

	• The heritage practitioner must compile a report and make recommendations for the way forward as well as the legal requirements • The relevant permits must be obtained from ECPHRA should any other heritage resources need to be relocated or demolished prior to construction or appropriate buffers around these resources must be adopted.
	• All previously undetected heritage remains / graves must be located as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work. • The heritage structure must be documented in collaboration with cultural historian/architect prior to alteration. • Since the site is older than 60 years and generally protected under the NHRA, an application for an alteration permit must be made with relevant heritage authorities (SAHRA, SAHRA Built Environment) prior to the alteration of the site. The application for the permit must include public participation processes as stipulated by SAHRA Built Environment. • Regular examination of trenches and excavations and monitoring of the construction site must be conducted by the ECO throughout construction.
Construction site decommissioning	**Removal of equipment** • All structures comprising the construction camp are to be removed from site. • The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc., and these must be cleaned up and contaminants disposed of appropriately. • All hardened surfaces within the construction camp area must be ripped, all imported materials removed, and the area must be top soiled and re-grassed using the guidelines as set out in the section on Flora and Fauna that forms part of this document. **Temporary services** • The Contractor must arrange the cancellation of all temporary services. • Temporary roads must be closed and access across these blocked. • All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO. **Associated infrastructure** • Surfaces are to be checked for waste products from activities such as concrete batching and cleared in a manner approved by the ECO. • All surfaces hardened due to construction activities must be ripped and imported material thereon removed. • All rubble must be removed from the site to an approved disposal site as approved by the ECO. Burying of rubble on site is prohibited. • The site must be cleared of all litter. • The Contractor must check that all watercourses are free from building rubble, spoil materials and waste materials. • Fences, barriers and demarcations associated with the construction phase must be removed from the site. • All residual stockpiles must be removed or spread on site as directed by the ECO. • All leftover building materials must be removed from the site. • The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management. • Final inspection in order to ensure adherence to EMPr guidelines, completion of localised/ remaining areas of impact, monitoring of rehabilitation success, etc.

Inadequate rehabilitation	• The rehabilitation plan must be implemented during and after the construction has been completed. • All temporarily disturbed areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area or phase of work is complete, i.e. rehabilitation is on-going throughout construction as phases have been completed. • All impacted areas must be restored as per the EMPr requirements.
Operational Phase	
Legal and policy compliance	• All relevant legislation and policy must be consulted and the proponent must ensure that the project is compliant with such legislation and policy. The operational conditions outlined in the EA must be adhered to.
Bulk services and infrastructure	• Any bulk services or service infrastructure damaged during the construction must be rehabilitated immediately. • Regular maintenance and inspections of all infrastructure and services must be undertaken throughout construction phase. A close out inspection must be undertaken upon completion of construction.
Stormwater management	• Regular maintenance of the stormwater structures associated with the culvert upgrade and road realignments must continue throughout the entire duration of the operational phase.
Erosion and sedimentation	• Banks must be rehabilitated, including re-establishment of vegetation cover; • Continued maintenance of the Galway road culvert especially following a flooding event must take place; • Areas along the river bank which were previously affected by erosion must be rehabilitated with indigenous vegetation.
Establishment of alien vegetation	• An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project. • The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation. • Regular monitoring of the implementation of this plan for the rehabilitation of disturbed areas must be conducted by the appointed ECO.
Inadequate rehabilitation and maintenance	• Rehabilitation Plan must be developed and implemented continuously throughout construction. • The rehabilitation of the disturbed areas must be monitored for a period of 6-12 months after completion of construction activities.

7 ENVIRONMENTAL MONITORING

According to regulation 33 of GN R 543, an environmental management programme must include:
(e) proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

7.1 General environmental monitoring

A monitoring programme will be implemented for the duration of the construction of the culvert. This programme will include:

- Establishing a baseline through the taking of photographs of identified environmental aspects and potential impact sites along the routes prior to construction
- Monthly audits will be conducted by the Environmental Control Officer for the remainder of the construction phase to ensure compliance to the EMPr conditions, and where necessary make recommendations for corrective action. These audits can be conducted randomly and do not require prior arrangement with the Project Coordinator.
- Compilation of an audit report with a rating of compliance with the EMPr. The ECO shall keep a photographic record of any damage to areas outside the demarcated site and construction area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

8 ENVIRONMENTAL AWARENESS

According to regulation 33 of GN R 543, an environmental management programme must include:

(j) An environmental awareness plan describing the manner in which –

(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the ECO where necessary.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes shall contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The ECO shall ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience.

The Developer shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the EMPr. The presentation needs to be conducted in the language of the employees to ensure it is understood. The environmental training shall, as a minimum, include the following:

- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirement of the Agency's environmental management systems, 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.
- Environmental legal requirements and obligations.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction of the culvert , main access roads, approach roads or construction camps.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- 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 which may be unearthed during construction and the procedures to be followed should these be encountered.

Recommended Environmental Education Material is provided in Appendix 1

8.1 Monitoring of environmental training

The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.

9 COMPLIANCE WITH THE EMPr

According to regulation 33 of GN R 543, an environmental management programme must include:

(e) Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

(i) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

A copy of the EMPr must be kept on site at all times during the construction period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses.

It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The 'polluter pays' principle).

9.1 Non-compliance

The contractors shall act immediately when notice of non-compliance is received and put corrective procedures and actions in place. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority for them to deal with the transgression, as it deems fit.

The Contractor is deemed not to have complied with the EMPr if, *inter alia*:

- there is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and roads;
- there is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site.
- environmental damage ensues due to negligence;
- construction activities take place outside the defined boundaries of the site; and/or
- the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time period.

It is recommended that the engineers/contractors institute penalties for the following less serious violations and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- 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 at designated facilities.

9.2 Emergency preparedness

The Contractor 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 construction period. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (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.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor 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 NEMA, 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.

9.3 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 extent of the impact; and
- 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.

9.4 Penalties

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the developer and/or contractor shall be liable.

The following violations, and any others determined during the course of work, should be penalised:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

10 CLOSURE PLANNING

According to regulation 33 of GN R 543, an environmental management programme must include:
(k) where appropriate, closure plans, including closure objectives.

Final site cleaning - the contractor shall clear and clean the site and ensure that everything not forming part of the permanent works is removed from site before issuing the completion certificate or as otherwise agreed.

Rehabilitation - the contractor (landscape architect/horticulturist) shall be responsible for rehabilitating and re-vegetation of all areas disturbed/areas earmarked for conservation during construction to the satisfaction of the engineer and ECO.

10.1 Post-Construction environmental audit

A post-construction environmental audit must be carried out and submitted to DEDEAT at the expense of the developer so as to fulfil conditions of the Environmental Authorisation granted. Objectives should be to audit compliances with the key components of the EMPr, to identify main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

10.2 General review of EMPr

The EMPr will be reviewed by the ECO on an ongoing basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on site.

Any such changes or updates will be registered in the ECO's record, as well as being included as an annexure to this document. Annexure of this nature must be distributed to all relevant parties.

11 REPORTING

11.1 Administration

Before the contractor begins each construction activity, the Contractor shall give to the ECO and 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.
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original.

The ECO and/or engineer may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly.

11.2 Good housekeeping

The contractor shall undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

11.3 Record keeping

The engineer and the ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the engineer shall issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the engineer in the monthly report. These reports shall be made available to DEDEAT when requested.

The Contractor shall ensure that an electronic filing system identifying all documentation related to the EMP is established.

A list of reports likely to be generated during all phases of the Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Final Environmental Impact Assessment Report.
- Environmental Management Plan.
- Final design documents and diagrams issued to and by the Contractor.

- All communications detailing changes of design/scope that may have environmental implications.
- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the EIA from the DEDEAT.
- All method statements from the Contractor for all phases of the project.

11.4 Document control

The Contractor and resident engineer shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMPr are performed. All documents shall be made available to the independent external auditor.

12 CONCLUSIONS

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Galway Road Culvert Upgrade as detailed in the BAR and specialist reports. The EMPr could thus change daily, and if managed correctly lead to successful construction and operational phases.

Further guidance should also be taken for any conditions contained in the Environmental Authorisation, if the project is granted approval, and that these DEDEAT conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

APPENDIX 1

PROPOSED ENVIRONMENTAL EDUCATION COURSE

WHAT IS THE ENVIRONMENT?

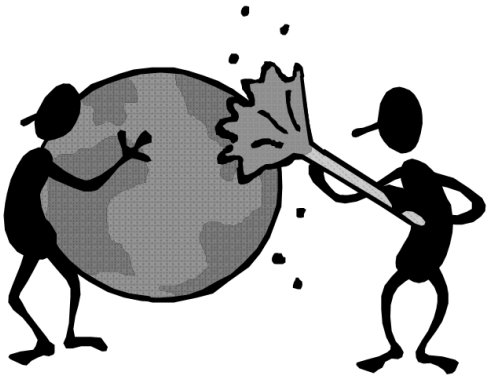
- Soil
- Water
- Plants
- People
- Animals
- Air we breathe
- Buildings, cars and houses

WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A contract has been signed
- Disciplinary action (e.g. construction could stop or fines issued)

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

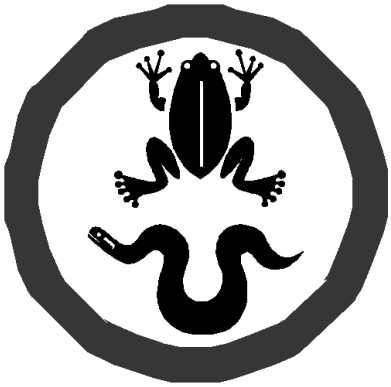
Workers & equipment must stay inside the site boundaries at all times

RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream

ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers

SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission

PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed

DUST

Try to avoid producing dust –

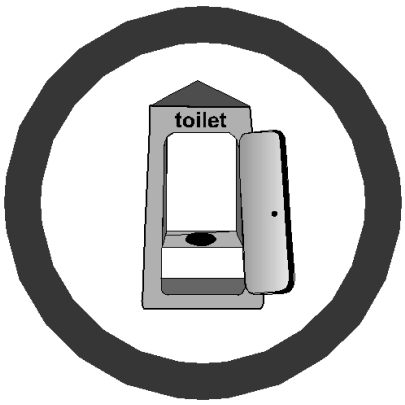
Use water to make ground & soil wet

NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles

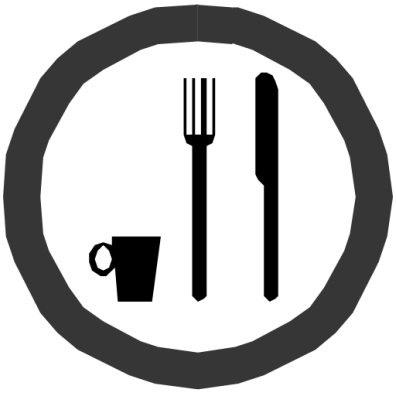
TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins



RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly

TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers – check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill

EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police:

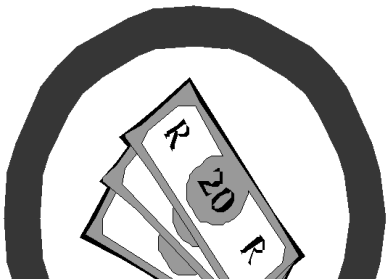
Buffalo City Metropolitan Municipality

FINES AND PENALTIES

- Spot fines of between

To be confirmed by Engineer

- Your company may be fined



PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!

APPENDIX 2

PRO-FORMA: PROTECTION OF THE ENVIRONMENT

To be signed by Contractors

PRO FORMA

Employer_____

Contract No_____

Contract title_____

PROTECTION OF THE ENVIRONMENT

The Contractor will not be given right of access to the site until this form has been signed.

I/ we_____(Contractor) record as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.

2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in so far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.

3. I/ we acknowledge and accept the right of _____ to deduct, should they so wish, from any amounts due to me/us, such amounts (hereinafter referred to as fines) as the Resident Engineer and Environmental Site Officer shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:

   3.1 The Resident Engineer and Environmental Officer, in determining the amount of such fine, shall take into account *inter alia*, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences.

3.2 The Resident Engineer and Environmental Officer shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Resident Engineer and Environmental Officer has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed_____
CONTRACTOR

Date_____

APPENDIX 3
CV OF THE EAP

ALAN ROBERT CARTER
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

CONTACT DETAILS

Name of Company	**CES – Environmental and Social Advisory Services**
Designation	East London Branch
Profession	Executive
Years with firm	17 (Seventeen) Years
E-mail	a.carter@cesnet.co.za
Office number	+27 (0)43 7267809 / 8313
Nationality	South African
Professional Body	SACNASP: South African Council for Natural Scientific Profession EAPSA: Environmental Assessment Practitioners Southern Africa IWMSA: Institute Waste Management Southern Africa TSBPA: Texas State Board of Public Accountancy (USA)
Key areas of expertise	➢ Marine Ecology ➢ Environmental and coastal management ➢ Waste management ➢ Financial accounting and project feasibility studies ➢ Environmental management systems, auditing and due-diligence

PROFILE

Alan has extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He is a member of the American Institute of Certified Public Accountants (licensed in Texas) and holds a PhD in Plant Sciences. He is also a certified ISO14001 EMS auditor with the American National Standards Institute. Alan has been responsible for leading and managing numerous and varied consulting projects over the past 25 years.

ALAN ROBERT CARTER
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

EMPLOYMENT EXPERIENCE

- October 2013 – Present: Executive (EOH Coastal & Environmental Services, East London, South Africa)
- January 2002 – September 2013: Director (Coastal & Environmental Services, East London, South Africa)
- January 1999 – December 2001: Manager (Arthur Andersen LLP, Public Accounting Firm, Chicago, Illinois USA)
- December 1996 – December 1998: Senior Accountant/Auditor (Ernst & Young LLP, Public Accounting Firm, Austin, Texas, USA).)
- January 1994 – December 1996: Senior Accountant/Auditor (Ernst & Young, Charteris & Barnes, Chartered Accountants, East London, South Africa)
- July 1991 – December 1994: Associate Consultant (Coastal & Environmental Services, East London, South Africa)
- March 1989 – June 1990: Data Investigator (London Stock Exchange, London, England, United Kingdom)

ACADEMIC QUALIFICATIONS

- Ph.D. Plant Science (Marine) Rhodes University 1987
- B. Compt. Hons. Accounting Science University of South Africa 1997
- B. Com. Financial Accounting Rhodes University 1995
- B.Sc. Hons. Plant Science Rhodes University 1983
- B.Sc. Plant Science & Zoology Rhodes University 1982

COURSES

- *Environmental Management Systems Lead Auditor Training Course - American National Standards Institute and British Standards Institute (2000)*
- *ISO 14001:2015 Implementing Changes - British Standards Institute (2015)*
- *Numerous other workshops and training courses*

CONSULTING EXPERIENCE

Environmental Impact Assessment, Feasibility and Pre-feasibility Assessments

- Managed numerous projects and prepared environmental impact assessment (EIA) reports in terms of relevant EIA legislation and regulations for development proposals including: Infrastructure projects: bulk water and waste water, roads, electrical, mining, ports, aquaculture, renewable energy (solar and wind), industrial processes, housing developments, golf estates and resorts, etc. (2002 – present).
- Projects have also included preparation of applications in terms of other statutory requirements, such as water-use and mining licence /permit applications.
- Managed projects to develop pre-feasibility and feasibility assessments for various projects, including various tourism developments, infrastructure projects, etc.
- Managed project for the East London Industrial Development Zone (ELIDZ) to develop a Conceptual Framework for a Mariculture Zone within the ELIDZ (2009).
- Managed pre-feasibility study to establish a Mariculture Zone within the Coega Industrial Development Zone (2014).
- Assisted City of Johannesburg in the process to proclaim four nature reserves in terms of relevant legislation (2015-2016).

ALAN ROBERT CARTER
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

- Acted as Environmental Control Officer (ECO) for numerous projects including solar and wind farms, roads, industrial processes, etc.

Strategic Environmental Assessment

- Managed Strategic Environmental Assessment (SEA) project toward the development of a Biofuel Industry in the Eastern Cape Province of South Africa (2014-2016)
- Managed Strategic Environmental Assessment (SEA) projects for two South African ports (2006 – 2007).
- Managed Strategic Environmental Assessment (SEA) projects for five (5) local municipalities in the Eastern Cape as part of the municipal Spatial Development Framework plans (2004 – 2005).
- Involved in the financial assessment of various land-use options and carbon credit potential as part of a larger Strategic Environmental Assessment (SEA) for assessing forestry potential in Water Catchment Area 12 in the Eastern Cape of South Africa (2006).

Climate change, emissions trading and renewable energy

- Provided specialist peer review services for National Department of Environmental Affairs relating to climate change impact assessments for large infrastructure projects (2017-2018).
- Conducted climate change impact assessment for a proposed coal-fired power station in Africa (2017-2018).
- Participated in the development of a web-based Monitoring & Evaluation (M&E) system for climate change Mitigation and Adaptation in South Africa for National Department of Environmental Affairs (DEA) (2015-2016.
- Managed project to develop a Climate Change Strategy for Buffalo City Metro Municipality (2013).
- Managed projects to develop climate change strategies for two district municipalities in the Eastern Cape Province (2011).
- Conducted specialist carbon stock and greenhouse gas emissions impact and life cycle assessment as part of the Environmental, Social and Health Impact Assessment for a proposed sugarcane to ethanol project in Sierra Leone (2009 - 2010) and a proposed Jatropha bio-diesel project in Mozambique (2009 - 2010).
- Managed project to develop the Eastern Cape Province Climate Change Strategy (2010).
- Managed project to develop a Transnet National Ports Authority Climate Change Risk Strategy (2009)
- Participated in a project to develop a Renewable Energy roadmap for the East London Industrial Development Zone (ELIDZ) (2013).
- Participated in a project for the East London Industrial Development Zone (ELIDZ) and Eastern Cape Government to prepare a Renewable Energy Strategy (2009).
- Contributed to the development of Arthur Andersen LLP's International Climate Change and Emissions Trading Services (2001).
- Conducted carbon credit (Clean Development Mechanism - CDM) feasibility assessment for a variety of renewable energy projects ranging from biogas to solar PV.
- Participated in the preparation of CDM applications for two solar PV projects

in the Eastern Cape.

Waste Management

- Managed project to develop Integrated Waste Management Plans for six local municipalities on behalf of the Sarah Baartman District Municipality in the Eastern Cape Province (2016).
- Managed project to develop Integrated Waste Management Plans for four local municipalities on behalf of Alfred Nzo District Municipality in the Eastern Cape Province (2015).
- Managed project to develop Integrated Waste Management Plans for eight local municipalities on behalf of Chris Hani District Municipality in the Eastern Cape Province (2011).
- Managed a project to develop a zero-waste strategy for a community development in the Eastern Cape Province (2010).
- Managed waste management status quo analysis for a District Municipality in the Eastern Cape Province (2003).
- For three consecutive years, managed elements of the evaluation of the environmental financial reserves of the three largest solid waste companies (Waste Management, Inc., Republic Services, Inc., Allied Waste, Inc.) and number of smaller waste companies in the USA as part of the annual financial audit process for SEC reporting purposes. Ensured compliance with RCRA and CERCLA environmental regulations.
- Managed elements of the evaluation of the environmental financial reserves of the largest hazardous waste company in the USA (Safety-Kleen, Inc.), as part of the audit process for SEC reporting purposes. Ensured compliance with RCRA and CERCLA environmental regulations.

Environmental Due Diligence and Business Risk

- Conducted environmental due diligence projects on behalf of the German Development Bank for a forestry pulp and paper operation in Swaziland (2010) and for a large diversified South African agricultural/agro-processing company (2011)
- Managed project for the Transnet National Ports Authority to identify the environmental risks and liabilities associated with the operations of the Port of Durban as part of a broader National initiative to assess business and financial risks relating to environmental management (2006).
- Managed project to determine the financial feasibility of various proposed tourism developments for the Kouga Development Agency in the Eastern Cape Province (2006)
- Contributed significantly to a study to determine the financial and environmental feasibility of three proposed tourism development projects at Coffee Bay on the Wild Coast (2004).
- Conducted sustainability and cost/benefit analysis of various waste water treatment options (including a marine pipeline at Hood Point) for the West Bank of East London (2004).
- Conducted analysis of permit fees and application processing costs for off-road vehicle use on the South African coastline for the Department of Environmental Affairs and Tourism, Marine & Coastal Management (2003).
- Involved in the determination of the historical cost element of environmental remediation insurance claims for a number of multinational

ALAN ROBERT CARTER
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

companies, including Dow Chemicals, Inc. and International Paper, Inc.
- Evaluated the environmental budgeting process of the US Army and provided best practice guidance for improving the process.

Policy and Guidelines
- Development of Administration / Application Fee Structure for the Reclamation of Land, Coastal Use Permits, Coastal Waters
- Discharge Permits, Dumping Of Waste at Sea, Off-Road Vehicle Regulations Promulgated in Terms of the National Environmental Management Act: Integrated Coastal Management Act (Act No. 24 Of 2008) (2017).
- Managed project to develop an Estuarine Management Plan for the Buffalo River Estuary for the National Department of Environmental Affairs (2017).
- Managed project to develop a Coastal Management Programme for Amathole District Municipality, Eastern Cape (2015 – 2016).
- Managed project to develop a sustainability diagnostic report as part of the development of the Eastern Cape Development Plan and Vision 2030 (2013).
- Managed project for the Department of Environmental Affairs and Tourism, Marine & Coastal Management to determine the cost implications associated with the implementation of the Integrated Coastal Management Act (2007).
- Managed project to develop a Conservation Plan and Municipal Open Space System (MOSS) for Buffalo City Municipality (2007)
- Managed project to develop a Sanitation Policy and Strategy for Buffalo City Municipality, Eastern Cape (2004 – 2006).
- Managed project to develop an Integrated Environmental Management Plan and Integrated Coastal Zone Management Plan for Buffalo City Municipality, Eastern Cape (2004 – 2005).
- Managed projects to develop and implement an Environmental Management System (EMS) for the Chris Hani and Joe Gqabi (formerly Ukhahlamba) District Municipalities in the Eastern Cape generally in line with ISO14001 EMS standards (2004 – 2005).
- Managed project to develop a State of the Environment Report and Environmental Implementation Plans for Amathole, Chris Hani, OR Tambo and Joe Gqabi District Municipalities in the Eastern Cape Province (2005 – 20010).
- Conducted analysis of permit fees and application processing costs for off-road vehicle use on the South African coastline for the Department of Environmental Affairs and Tourism, Marine & Coastal Management (2003).

Environmental auditing and compliance
- Conducted environmental legal compliance audit for various large Transnet Freight Rail facilities (2018).
- Managed projects to develop Environmental & Social Management Systems (ESMS) in line with IFC Performance Standards for three (3) wind farms in South Africa (2015-2018).
- Managed project to develop an Environmental & Social Management System (ESMS) in line with IFC Performance Standards for a telecoms company in Zimbabwe on behalf of the German Development Bank (2013)
- Participated in numerous ISO14001 Environmental Management System (EMS) audits for large South African corporations including SAPPI, BHP

ALAN ROBERT CARTER
Curriculum Vitae

Billiton, SAB Miller, Western Platinum Refinery, Dorbyl Group and others (2002 – present).

- Reviewed the SHE data reporting system of International Paper, Inc. (IP) for three successive years as part of the verification of the IP SHE Annual Report, which included environmental assessments of 12 IP pulp and paper mills located throughout the USA.
- Conducted Environmental Management System (EMS) reviews for a number of large US corporations, including Gulfstream Aerospace Corporation

Public financial accounting

- While with Ernst & Young LLP, (USA), functioned as lead financial auditor for various public and private companies, mostly in the technology business segment of up to $200 million in annual sales. Client experience included assistance in a $100 million debt offering, a $100 million IPO and SEC annual and quarterly reporting requirements.
- Completed three years of articles (training contract) in fulfilment of the certification requirements of the South African Institute of Chartered Accountants which included auditing, accounting and preparation of tax returns for many small to medium sized commercial entities.

PUBLICATIONS

Refereed Publications

- Carter, A.R. 1985. Reproductive morphology and phenology, and culture studies of Gelidium pristoides (Rhodophyta) from Port Alfred in South Africa. Botanica Marina 28: 303-311.
- Carter, A.R. 1993. Chromosome observations relating to bispore production in Gelidium pristoides (Gelidiales, Rhodophyta). Botanica Marina 36: 253-256.
- Carter, A.R. and R.J. Anderson. 1985. Regrowth after experimental harvesting of the agarophyte Gelidium pristoides (Gelidiales: Rhodophyta) in the eastern Cape Province. South African Journal of Marine Science 3: 111-118.
- Carter, A.R. and R.J. Anderson. 1986. Seasonal growth and agar contents in Gelidium pristoides (Gelidiales, Rhodophyta) from Port Alfred, South Africa. Botanica Marina 29: 117-123.
- Carter, A.R. and R.H. Simons.1987. Regrowth and production capacity of Gelidium pristoides (Gelidiales, Rhodophyta) under various harvesting regimes at Port Alfred, South Africa. Botanica Marina 30: 227-231.
- Carter, A.R. and R.J. Anderson. 1991. Biological and physical factors controlling the spatial distribution of the intertidal alga Gelidium pristoides in the eastern Cape Province, South Africa. Journal of the Marine Biological Association of the United Kingdom 71: 555-568.

Published reports

- Water Research Commission. 2006. Profiling Estuary Management in Integrated Development Planning in South Africa with Particular Reference to the Eastern Cape. Project No. K5/1485.
- Turpie J., N. Sihlophe, A. Carter, T, Maswime and S. Hosking. 2006. Maximising the socio-economic benefits of estuaries through integrated planning and management: A rationale and protocol for incorporating and

ALAN ROBERT CARTER
Curriculum Vitae

enhancing estuary values in planning and management. Un-published Water Research Commission Report No. K5/1485

Conference Proceedings

- Carter, A.R. 2002. Climate change and emission inventories in South Africa. Invited plenary paper at the 5th International System Auditors Convention, Pretoria. Held under the auspices of the South African Auditor & Training Certification Association Conference (SAATCA).
- Carter, A.R. 2003. Accounting for environmental closure costs and remediation liabilities in the South African mining industry. Proceedings of the Mining and Sustainable Development Conference. Chamber of Mines of South Africa, Vol. 2: 6B1-5
- Carter, A.R. and S. Fergus. 2004. Sustainability analysis of wastewater treatment options on the West Bank of East London, Buffalo City. Proceedings of the Annual National Conference of the International Association for Impact Assessment, South African Affiliate: Pages 295-301.
- Carter, A., L. Greyling, M. Parramon and K. Whittington-Jones. 2007. A methodology for assessing the risk of incurring environmental costs associated with port activities. Proceedings of the 1st Global Conference of the Environmental Management Accounting Network.
- Hawley, GL, McMaster AR and Carter AR. 2009, Carbon, carbon stock and life-cycle assessment in assessing cumulative climate change impacts in the environmental impact process. Proceedings of the Annual National Conference of the International Association for Impact Assessment, South African Affiliate.
- Hawley, GL, McMaster AR and Carter AR. 2010. The Environmental and Social Impact Assessment and associated issues and challenges. African, Caribbean and Pacific Group of States (ACP), Science and Technology Programme, Sustainable Crop Biofuels in Africa.
- Carter, A.R. 2011. A case study in the use of Life Cycle Assessment (LCA) in the assessment of greenhouse gas impacts and emissions in biofuel projects. 2nd Environmental Management Accounting Network- Africa Conference on Sustainability Accounting for Emerging Economies. Abstracts: Pages 69-70.

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

ALAN ROBERT CARTER Date: January 2019