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PROPOSED REMOVAL OF THE EARTH BERM WITHIN THE LITTORAL ACTIVE ZONE OF THE ORANGE RIVER ESTUARY, ALEXANDER BAY, NORTHERN CAPE.

DEPARTMENT OF ENVIRONMENT AND NATURE CONSERVATION
NORTHERN CAPE

DRAFT CONSTRUCTION PHASE AND POST CONSTRUCTION PHASE ENVIRONMENTAL MANAGEMENT PROGRAMME AND ARTIFICIAL MOUTH BREACHING GUIDELINES

PROPOSED REMOVAL OF THE EARTH BERM WITHIN THE LITTORAL ACTIVE ZONE OF THE
ORANGE RIVER ESTUARY, ALEXANDER BAY, NORTHERN CAPE

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LIST OF ABBREVIATIONS

Compact Disk	CD
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	CARA
Draft Basic Assessment Report	DBAR
Department of Environmental Affairs	DEA
Department of Environment and Nature Conservation: Northern Cape	DE&NC
Department of Environmental Affairs and Development Planning	DEA&DP
Department of Water Affairs	DWA
Directorate of Parks and Wildlife Management	DPWM
Environmental Assessment Practitioner	EAP
Environmental Control Officer	ECO
Environmental Management Plan	EMP
Environmental Management Programme	EMPr
Final Basic Assessment Report	FBAR
Hectare	Ha
Heritage Northern Cape	HNC
Interested and Affected Parties	I&APs
Land Use Planning Ordinance (Ordinance 15 of 1985)	LUPO
Mineral Petroleum Resources Development Act, 2002 (Act 28 of 2002)	MPRDA
Namibian Ministry of Environment and Tourism	NA-MET
National Department of Agriculture, Forestry and Fisheries	DAFF
National Environmental Management Act, (Act 107 of 1998)	NEMA
National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003)	NEMPAA
National Water Act, 1998 (Act No. 36 of 1998)	NWA
Notice of Intent to Develop	NID
Orange River Mouth	ORM
Orange River Mouth Interim Management Committee	ORMIMC
Orange-Senqu River Commission	ORASECOM

Previously Disadvantaged Individual	PDI
Provincial Spatial Development Framework	PSDF
Republic of South Africa	RSA
Sida !hub Communal Property Association	CPA
Strategic Integrated Projects	SIPS
Spatial Development Framework	SDF
Transfrontier Conservation Areas	TFCA
Withers Environmental Consultants	WEC

SECTION A: THE SCOPE OF THE ENVIRONMENTAL MANAGEMENT PLAN

This section describes the scope of the Environmental Management Plan (**EMP**) for the Construction and Post Construction of the proposed removal of the earth berm, construction of a new berm adjacent to the sports fields and the low portions of Alexander Bay bordering onto the estuary, and the artificial breaching of a sand berm near the Orange River mouth, and how this document is to be used.

The EMP, together with its various Environmental Management Programmes (**EMPs**), must be read together with the Basic Assessment Report (**BAR**), and with the conditions of approval that the Department of Environmental Affairs (**DEA**) will issue should the proposed project be approved. To allow this EMP to be a “stand alone document”, the main environmental background information pertaining to the proposed development is included into the EMP document.

The EMP incorporates the recommendations made the BAR in respect of the various mitigating actions that need to be undertaken during the construction and post construction phases of the project, so as to:

- (a) minimise potential adverse impacts; and
- (b) enhancing potential beneficial impacts of the project, thereby ensuring sustainable development to take place.

The EMP covers the spectrum of pre-construction, construction and artificial breaching of the sand berm of the project. The directives and guidelines covered in respect of the above phases are provided by the various EMPs. The EMP is basically the *‘management tool’* for providing management guidelines for the construction methodology and supervision of the construction of the project to ensure that environmental impacts are minimised. In addition, the EMPs provide the necessary guidelines to the Environmental Control Officer (**ECO**), Alexkor, consulting engineers, construction supervisor and, to the Applicant, the Department of Environment and Nature Conservation (**DN&NC**) (and Provincial Authority Contact Person) to ensure that:

- initially the contractors and their subcontractors fulfil their construction role in an environmentally responsible manner.

Section B of this EMP provides a brief description of the activities that are relevant to this EMP and the relevant environmental legislation. The physical, biological and socio-economic characteristics of the site and its surrounding environment are also described in Section B.

Section C provides the policy, vision, goals and principles as relevant to this EMP.

Section D describes the duties and responsibilities of the ECO and the other members of the project team and it describes the environmental objectives, environmental aspects (project activities), environmental targets, mitigation measures (management actions), and responsible persons/parties as are relevant to the construction phase of the rehabilitation.

Section E describes the post construction phase mitigation measures.

Section F describes the way forward (“Operational Phase”) after implementing of this EMP.

Section G describes the monitoring and auditing requirements as are relevant to this EMP, and

Section H addresses the continual improvement of this EMP.

Section I provides a conclusion to this EMP.

The EMP covers such aspects as the Vision set by the Applicant (and Provincial Authority Contact Person) for the project. Various Goals have been put forward for the achieving the Vision. A number of specific EMPs are set for achieving the various Goals of the project. To achieve these Goals, various Environmental Objectives are set for each of the EMPs. Various performance requirements or Targets are put forward to the specific Management Actions to be taken, as described below:

- **Environmental Objectives**

These objectives provide the means for achieving the overall environmental aims arising from the environmental policy that the relevant management entity (Provincial Authority Contact Person) and Alexkor may develop for any approved phase of the project) sets itself, and which are quantified where possible.

- **Environmental Targets**

These are detailed performance requirements, which are quantified where possible, and that arise from the environmental objectives. Targets need to be set and met in order to achieve the desired objectives.

- **Management Actions**

These are specific strategies and actions that are instituted for achieving the environmental targets within a specific timeframe. The actions are specific and measurable.

It is the responsibility of the Department of Environment and Nature Conservation and Alexkor to ensure adherence to the recommendations of the EMP, which will incorporate the conditions of approval to be set by DEA, and to review the results of the monitoring programmes and to facilitate any corrective action that may be necessary.

As part of its responsibility, the Applicant (Provincial Authority Contact Person) and/or Alexkor. must appoint an ECO to regulate the Construction Phases of the project in accordance with the conditions of approval. The EMP must form part of the tender documentation to ensure that appointed contractors understand what their environmental contract obligations are.

The duties of the ECO are as follows:

1. The ECO will:
 - Meet with the Applicant (Provincial Authority Contact Person) and Alexkor and consulting engineers to hand over the site of a particular phase to the appointed Contractor and go through the content of the EMP and ensure that the Contractor understands the environmental conditions of the contract;
 - Meet with the Contractor and staff before construction commences to initiate the EMP and particularly the “Construction Guidelines” (**Appendix 1**) and to go through the environmental “do’s and don’ts” of the project;
 - Attend the quarterly site meetings to assess progress and compliance with the conditions of approval and the recommendations of the EMP;
 - Complete an ECO Checklist after each site meeting and distribute it to all the relevant role players within five (5) working days. The ECO Checklist will act as environmental site instructions for the duration of the contract for the installation of the services and construction of buildings; and
 - Undertake environmental audits of the project once removal of the earth berm has been completed and again after construction of the new berm has been completed.
2. The Contractor’s Site Agent will monitor the day-to-day progress of the construction process. The consulting engineer should conduct monthly site visits and meetings with the Contractor and ECO. Should any environmental problems arise during the Construction Phase, the Site

Agent and/or consulting engineer must immediately inform the ECO to undertake a site visit to assess and attend to the potential environmental problem(s). All works where environmental problems exist are to be stopped until the ECO has been to site and assessed the situation and rectified the problem(s).

3. The results of the monitoring programmes (site meetings), which will be contained in the quarterly ECO Checklists, will be used for the compilation of audit reports. Such audit reports should be submitted to DEA and to the DE&NC about four weeks after the completion of the Construction Phase of the new berm and then again once the existing berm has been removed. The management entity of the Orange River Estuary will be responsible for the monitoring of the rehabilitation of the wetlands and old channels of the estuary.

Expertise of the Environmental Assessment Practitioner

Alexkor SOC Ltd. has appointed Withers Environmental Consultants (Pty) Ltd. (WEC) as the Environmental Assessment Practitioners (EAP) to undertake the above application process, and to prepare this EMP on their behalf. This EMP was prepared by Elize le Roux and Aubrey Withers of WEC.

Aubrey Withers has a B.Sc. (Hons) (Geology) degree, and is a Member of the South African Council for Natural Scientific Professionals.

As an environmental practitioner over the past 24 years, Aubrey has written over 200 reports dealing with diverse and complex environmental and planning projects. He has undertaken environmental planning for many coastal resort and residential development projects, which included various dune stabilisation programmes. Aubrey has also had extensive experience with the approvals of and construction supervision of all civil services (roads, pipelines, waste disposal facilities [including their decommissioning], waste treatment facilities and electrical substations). He has project management experience in many multi-disciplinary projects, from their inception through to commissioning and monitoring, to ensure environmental compliance with their conditions of approval and management system recommendations. He has a practical and positive approach to environmental planning, environmental management and implementation of all projects undertaken in a sound and sustainable way.

Aubrey has an in-depth knowledge of coastal processes, coastal planning and the rehabilitation of disturbed coastal areas. He has also played a role in facilitating the re-vegetation of the old mined working within the Alexkor mining area. He has also played a major role in drafting spatial coastal zone policy for the Western Cape Government, which included the entire coastline under their jurisdiction, for promoting sustainable development. Given his vast experience in the environmental management field, Aubrey has been appointed to assist many local authorities and government departments, including the Department of Environmental Affairs and Development Planning, with the review of complex development applications and environmental management systems of proposed developments.

Aubrey has also assisted town planners with the compilation of many diverse Spatial Development Frameworks (Plans) for Municipal jurisdiction areas. He was also directly involved with the groundwork for the formation of the Cape West Coast Biosphere Reserve. WEC has recently completed the compilation of an EMF for the jurisdiction area of the Overstrand Municipality to guide future spatial planning of the area.

Elize le Roux graduated from the Stellenbosch University with a B.Sc. Conservation Ecology degree in 2008. She joined WEC in July 2008 and has been responsible for the administration and management of nearly all the projects undertaken between then and present. She has also been responsible for researching the required information of many of the projects and has also been responsible for the compilation of management plans of such projects.

SECTION B: BACKGROUND INFORMATION

B.1 PROJECT DESCRIPTION AND APPROVAL CONTEXT

B.1.1 Description of the Proposed Project

The applicant, Department of Environment and Nature Conservation (DE&NC) and Alexkor State Owned Company (SOC) Limited (hereafter referred to as “Alexkor”) propose to restore historical environmental disturbances that occurred in the South African section of the Orange River Mouth (ORM)/Estuary, Alexander Bay, Northern Cape, namely the removal and rehabilitation of the flood attenuation berm constructed within the flood plain of the southern portion of the Orange River between 5km upstream of the ORM and the ORM (**Figure 1**). The rehabilitation will also include the rehabilitation of the agricultural fields located over original wetlands of the Orange River which were protected from flooding events by the berm. The property was previously owned by the mining company Alexkor. Alexkor has relinquished their mining right on Farm Rem/625 that falls within the Orange River Mouth Transboundary Ramsar Site (ORMTRS) and is now responsible for partial closure and rehabilitation of all disturbances in terms of the Mineral Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA). According to the Land Claim Settlement Agreement (Case Number 151/1998) between Alexkor and the Sida !hub Communal Property Association (CPA), Alexkor will be responsible for all historic disturbances. Although the DE&NC is the applicant in this application, the **responsibility** for the proposed EIA process in this application is to be undertaken by Alexkor, as set out in the Land Claim Settlement Agreement.

The Proposed Removal of the Earth Berm within the Littoral Active Zone of the Orange River Estuary will encompass the physical removal of the earth berm from the central and western sections of the estuary on Farm Rem/ 625 (**Location A**) (**Figure 1**). A portion of the berm that still protects the agricultural fields to the east from inundation of flood waters from the Orange River will need to remain intact.

In addition, to protect the lower lying areas of the northern, central sectors of Alexander Bay, and especially the rugby and sports grounds, a berm will need to be constructed from the existing eastern section of the berm diagonally towards the sports grounds and further to the west to protect these sports fields and other infrastructure from flood waters. Obviously the material removed from the earth berm will be reused to construct the new berm to be constructed around the low lying areas of the town (**Location B**).

The sand berm that has developed in the southern, flood meander channel of the Orange River near its mouth also needs to be artificially breached to reduce the salinity levels that build up from time to time within this cut-off channel (**Location C**). These high salinity levels are having a negative impact on the ecology of this section of the estuary.

The proposed project includes activities to be undertaken on three locations within the littoral active zone of the Orange River Estuary. For ease of discussion in this report, the project associated with the listed activities is referred to as **Location A, B and C (Figure 1, 3,5 ,6 and 7)**:

Location A: The proposed removal of the earth berm on Farm Re/625 within the littoral active zone of the Orange River Estuary. The management objectives of the proposed work to be undertaken at Location A is to improve floodwater flows into the degraded salt marsh area in order to promote restoration of the degraded salt marsh habitat and to limit impacts from adjacent mining operations (windblown sand and silt from the southern workings) and through appropriate restoration strategies. The preferred design alternative is to remove the berm on Farm Rem/625 (as indicated in **Figure 1 and 5**) and the design alternative 1, is to only remove the culverts placed in the berm near the mouth (**Figure 3**).

Location B: Proposed construction of a berm on Farm Re/625 to protect the lower lying areas of the northern, central sectors of Alexander Bay town, and especially the rugby and sports grounds and the access road to the mouth area (**Figure 1 and 6**).

Location C: Proposed artificially breaching of the sand berm in the Orange River Mouth. The sand berm that has developed in the southern, flood meander channel of the Orange River near its mouth also needs to be artificially breached to reduce the salinity levels that are currently building up in this cut-off channel (**Figure 7**). These high salinity levels are having a devastating impact on the ecology of this section of the estuary.

The proposed project comprises a number of listed activities in terms of the 2010 National Environmental Management Act (NEMA) (Act 107 of 1998) Environmental Impact Assessment (EIA) Listing Notices (R544 and R546), namely:

Table 1: Listed Activities Triggered

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :
R 544, 18 June 2010 (Listing Notice 1)	Activity No 11 The construction of: (xi) Infrastructure or structures covering 50m ² or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 16 Construction of earth moving activities in an estuary or within the littoral active zone or a distance of 100m inland of the high water mark of the sea or estuary, whichever is the greater, in respect of – (iii) embankments.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 17 The planting of vegetation or placing of any material on dunes or exposed sand surfaces, within the littoral active zone for the purpose of preventing free movement of sand, erosion or accretion.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 18 The infilling or depositing of any material of more than 5m ³ into, or dredging, excavation, removing of soil, sand, shells, shell grit, pebble or rock from (i) watercourse; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100m inland of the high water mark of the sea or an estuary, whichever is the greater.
R 546, 18 June 2010 (Listing Notice 3)	Activity No 16 The construction of: (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In Northern Cape: (i) In an estuary

B.1.2 Brief Description of the Environment

The proposed site for the removal of the Earth berm within the littoral active zone of the Orange River Estuary, construction of a new berm and the artificial breaching of the ORM, falls within Farm Rem/625, which forms part of the Orange River Mouth Wetland which is listed as a Ramsar Wetland. A Ramsar wetland was initially defined as one that supports appreciable numbers of globally and regionally important waterbird species.

The Ramsar Wetland is approximately 10 km from the Ernest Oppenheimer Bridge to the river mouth and covers 2000 ha of the ORMTRS. It is a coastal wetland of international importance located at the international border between the Republic of South Africa (RSA) and Namibia. The ORM may lose its status as a Ramsar site unless the condition of the salt marsh on Farm Rem/625 can be improved by the required restoration. Almost all the challenges facing the site have been resolved. The protected status of the ORM will enable the DE&NC and Managing Entities to begin managing and rehabilitating the wetland.

Climate

Average annual precipitation at the ORM is only 50 mm/yr with an average annual potential evaporation of over 3 000 mm/yr. The sparse rainfall occurs mainly in winter. Single very rare heavy showers can account for as much as the normal annual precipitation. Hail is seldom reported in this region.

The highest average maximum temperature (24.42 °C) occurs in January and the lowest average minimum temperature (8.7 °C) occurs in July.

Vegetation

The major vegetation types recognised include the island communities; dominated by *Scirpus littoralis*, *Phragmites australis* and *Sporobolus virginicus*; the peripheral marshland, dominated by *Sarcocornia pillansiae* and *Sporobolus virginicus*; and the *Lycium decumbens* floodplain vegetation.

Species which are tolerant of mildly saline conditions, such as *Scirpus littoralis*, only occur close to the mouth where the intrusion of seawater may influence the salinity level. The saltmarsh (on Farm Rem/625) on the southern bank of the ORM-system adjacent to the mouth is cut off from the rest of the system by the embankment of an access road to the mouth. One of the most striking features of the Orange River mouth is the apparent paucity of invertebrate estuarine fauna.

B.1.3 Socio-Economic Characteristics of the Surrounding Area

Richtersveld Local Municipality falls within the Namakwa District of the Northern Cape Province. The Northern Cape is spatially the largest province in the country, but also has the lowest population and some of the least developed areas in terms of its economic and social development. The population for Richtersveld is estimated at 14 125 people. The municipality is sparsely populated (± 1.4 person/km²), most people are settled in the Port Nolloth area, followed by Alexander Bay, Sanddrift and Kuboes. During the period 1996 – 2007, a population growth increase of 24.2% was experienced in the Richtersveld Municipal area with an accompanying 41.9% increase in the number of households. Indications from the district population suggest that there is a high level of movement out of the district due to job losses (i.e., closure of mines) and the young inhabitants moving out to attend institutes of higher learning elsewhere in the country. This movement also applies to economically active inhabitants. The result is that there are a high proportion of economically inactive people in the district, which in turn compounds poverty levels. The low literacy rate, high levels of unemployment and resultant social problems such as alcohol and drug abuse and the increase in crime and domestic violence need to be addressed, especially in the disadvantaged areas.

Richtersveld Municipality has a comparative advantage to other municipalities in Namakwa District based on its unique characteristics and combination of resources such as; Agricultural Land, Minerals, Coastline, Orange River and the Richtersveld Transfrontier National Park.

The area around the Orange River Mouth is very sparsely populated and access to the coast and estuary is controlled by diamond mining concession holders NAMDEB (Pty) Ltd in Namibia and Alexkor SOC Ltd in South Africa (Richtersveld Municipality 2009, Skov et al. 2009). The town of Oranjemund is situated on the northern bank of the Orange River Estuary and has a population of 7 500 (NAMDEB, 2012). The town was previously owned by the mining company with access restricted to employees of NAMDEB, their relatives and persons with pre-application. Alexander Bay, with a population of approximately 1,453 was also a privately owned mining town on the south bank of the estuary, and was until recently, inaccessible to anyone not working on or directly associated with Alexkor SOC Ltd.

Following a successful land claim by the CPA, the town is no longer a high security area and permits are no longer required to access the town. Access to the Orange-Senqu Estuary from the south bank is now also permitted, but as few people are aware of this fact, tourism in this area is almost non-existent. South of Alexander Bay, the nearest town is Port Nolloth, with a population of 8,652 persons, where mining, fishing and mariculture are listed as the main economic activities (Richtersveld Municipality, 2009). Fish processing establishments in both Port Nolloth and Luderitz are reported to be struggling due to poor catches. Diamond resources in the area have been significantly depleted and both NAMDEB and Alexkor SOC Ltd have scaled down their operation dramatically. Aligned with this, has been the process of converting the town of Oranjemund into a formally proclaimed town with the recent election of a Town Council. The same is destined for Alexandria Bay. Tourism, although low key at present, is a potential growth industry and looked towards as a future alternative to mining and fishing.

In summary, the direct socio-economic benefits from the estuary are currently very limited to recreational use of the area by residents and visitors to Alexander Bay and Oranjemund, who use the area for passive recreation (walking, camping, picnicking) and recreational angling. Biophysical changes to the estuary have almost certainly had some negative impact on recreational use (fishing, bird viewing). However, in future, with the downscaling in mining activity and reduction in commercial fish catches, it is expected that emphasis will shift towards ecotourism as the major economic activity in the region. In line with this the Namibian portion of the Ramsar site has been included in the recently established Sperrgebiet National Park in Namibia while plans are also in an advanced stage to have the South African section of the Ramsar site formally protected. The proposed removal of the berm and the opening of the channels feeding into the salt marsh will have a significant positive impact on restoring the natural functioning of the Orange River mouth and estuary, which will restore the confidence in the Ramsar site and the continued conservation of this area. As such, the southern portion of the estuary of the Orange River can also become an ecotourism destination. As such, Alexandria Bay could expect concomitant socio-economic benefits from the proposed project.

B.2 LEGAL ENVIRONMENTAL REQUIREMENTS OF THE APPLICATION

B.2.1 National Environmental Management Act (Act 107 of 1998)

The **National Environmental Management Act** (Act No. 107 of 1998) (NEMA) aims to provide for cooperative environmental governance:

- By establishing principles for decision-making on all matters relating to the environment; and
- By means of two mechanisms, namely: Environmental Implementation Plans, and Environmental Management Plans.

In order to be in a position to undertake the rehabilitation project in the Orange River Mouth, the Applicant needs to obtain Environmental Authorisation from the Department of Environmental Affairs in Pretoria (DEA) to lawfully undertake the activities (Activities 11, 16, 17 and 18), listed in Listing Notice 1 and activities (Activity 16) listed in Listing Notice 3 of the Environmental Impact Assessment Regulations, 2010, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), and which came into effect on the 2nd of August 2010.

Table 1: Listed Activities Triggered

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :
R 544, 18 June 2010 (Listing Notice 1)	Activity No 11 The construction of: (xi) Infrastructure or structures covering 50m ² or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 16 Construction of earth moving activities in an estuary or within the littoral active zone or a distance of 100m inland of the high water mark of the sea or estuary, whichever is the greater, in respect of – (iii) embankments.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 17 The planting of vegetation or placing of any material on dunes or exposed sand surfaces, within the littoral active zone for the purpose of preventing free movement of sand, erosion or accretion.
R 544, 18 June 2010 (Listing Notice 1)	Activity No 18 The infilling or depositing of any material of more than 5m ³ into, or dredging, excavation, removing of soil, sand, shells, shell grit, pebble or rock from (i) watercourse; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100m inland of the high water mark of the sea or an estuary, whichever is the greater.
R 546, 18 June 2010 (Listing Notice 3)	Activity No 16 The construction of: (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In Northern Cape: (i) In an estuary

Activity 11 of Listing Notice 1 and **Activity 16** of Listing Notice 3 is triggered since the proposed project construction work occurs within 32m of a watercourse (degraded salt marshes and the Orange River itself). Activity 16 of Listing Notice 1 is triggered since construction of earth moving activities in an estuary or within the littoral active zone in respect of embankments, is proposed to be undertaken.

Activity 17 of Listing Notice 1 is triggered since the proposed project work includes planting of vegetation or placing any material on dunes or exposed sand surfaces, within the littoral active zone for the purposes of preventing free movement of sand, erosion or accretion.

Activity 18 of Listing Notice 1 is triggered since infilling or depositing of materials of more than 5m³ is proposed into, or dredging, excavation, removing of soil, sand, shells, shell grit, pebble or rock from a watercourse, the seashore and the littoral active zone or an estuary.

Activities triggered in Listing Notice 1 and 3 require an independent environmental study (Basic Assessment Process) to be conducted, which is not as comprehensive as a full Environmental Impact Assessment. Withers Environmental Consultants (WEC) was appointed by the DE&NC and Alexkor SOC Ltd. to undertake the Basic Assessment Process.

The NEMA requires that an EMP be submitted along with the Basic Assessment Report to demonstrate how environmental management and mitigation measures will be implemented.

As such, this EMP will be submitted to DEA and DE&NC for approval along with the Draft and Final Basic Assessment Report. Once an environmental authorisation has been issued by DEA, this EMP document may need to be revised to ensure that all relevant conditions of authorisation put forward by DEA have been adequately captured.

The content of this EMP has also been aligned with Section 24 (N) of the NEMA, which lists, *inter alia*, the required content of an “environmental management programme”.

B.2.2 National Water Act, 1998 (Act No. 38 of 1998) (NWA)

The objectives of the National Water Act, 1998 (Act No. 38 of 1998) (NWA) are to provide for fundamental reform of the law relating to water resources; to repeal certain laws; and to provide for matters connected therewith. The NWA governs water use and the protection of inland water resources.

In keeping with the requirements of the NWA, various directives have been set out in the EMPs to prevent pollution, and to protect surface and ground-water resources in the vicinity of the project site.

Comment on the Draft EMP and this Draft EMP by Department Water Affairs has been requested and the necessary procedures to follow in terms of the NWA for this project.

SECTION C: PROJECT POLICIES, VISION, GOALS AND PRINCIPLES

The purpose of the EMP is to provide guidelines to Alexkor and the project team for managing the relevant impacts associated with the construction and rehabilitation work on the surrounding environment during the Planning, Design, Construction and Post Construction Phases, by implementing / ensuring that:

- the mitigation of the environmental impacts identified during the Basic Environmental Assessment Process are undertaken in terms of the regulations of the NEMA;
- the Conditions of Approval to be issued by DEA (as part of the Environmental Authorisation) are taken into account;
- the stated objectives and targets set by the Applicant (and Provincial Authority Contact Person), meets the general environmental policy set for the project; and
- the environmental recommendations, including environmental monitoring put forward for the Construction and Post Construction Phases are met.

To achieve the above, it is important that the development take into account the site characteristics, natural surroundings and the relevant legislation, and that the EMP is practically structured and implemented so that impacts are minimised during the Construction Phases (removal of earth berm and construction of new berm) and the Post Construction Phases of the project.

C.1 ENVIRONMENTAL POLICY

The following primary environmental policy statements are relevant to this EMP:

- The aspects and activities of Alexkor and its management, as are relevant to this EMP, will be undertaken in accordance with the relevant legislation and with the vision, goals and principles put forward in this EMP.
- The environment¹ forms the fundamental basis of the proposed project. All construction and operational activities must, therefore, conform to the principle of environmental sustainability and must be carried out in such a way that potential negative environmental impacts on Farm Rem/625 and the Orange River Estuary and surrounds are minimised, whilst any positive environmental impacts are enhanced.

C.2 VISION AND GOALS

The conceptual planning, rehabilitation and operation of the Lower Orange River Estuary are based on the vision statement and goals set by the Applicant (Provincial Authority Contact Person) as described below.

C.2.1 Vision

The vision of this project is to facilitate the protection, conservation, rehabilitation and sustainable use of the estuary of the Orange River, in accordance with national policies and commitment to international conventions and regional relationships (with other countries), as anticipated in terms of Section 23 of NEMA.

¹ "Environment" (as defined in NEMA, (Act 107 of 1998)) means the surroundings within which humans exist and that are made up of- (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

The aims of this EMP are to rehabilitate and manage Farm Rem/625 and the Lower Orange River Estuary in such a way that it will:

- *ensure sustainable development in all its facets and in particular during the Construction Phases of the project;*
- *ensure that the rehabilitation of the wetlands and old channels of the Orange River are appropriately rehabilitated and that the conservation of the surrounding environment (biophysical, socio-economic and cultural-historic characteristic), and its natural cultural landscape setting and intrinsic attributes of the area takes place;*
- *lead to a better appreciation, understanding, use and conservation of the natural resources by the Richtersveld community;*
- *facilitate the long term rehabilitation of the wetlands, thereby promoting long term ecotourism of the area; and*
- *provide both temporary and permanent job opportunities within the local community.*

C.2.2 Goals

The **Goals** for upholding the above vision for the proposed rehabilitation on Farm Rem/625, Alexander Bay are the following:

- To remove the berm and the opening of channels to the salt marshes, thereby improving flows into the degraded salt marsh area in order to promote restoration of the degraded salt marsh habitat;
- To rehabilitate the degraded environment (sewage maturation ponds) and to limit impacts from adjacent mining operations by the prevention of windblown sediments from old mine workings into the estuary through appropriate restoration strategies;
- To artificially breach the sand berm that has developed in the southern, flood meander channel of the Orange River near its mouth to reduce the salinity levels that are currently building up in this channel;
- To minimise negative environmental impacts that could arise during the Construction Phase, such as dust, wind erosion of cleared surfaces, construction noise, etc.;
- To enhance positive environmental impacts (particularly biophysical and socio-economic) that could arise during the Construction and Post Construction Phases of the project, such as the creation of ecotourism job opportunities and the development of skills for the local community; and
- To ensure the health and safety of construction workers during the Construction Phases and permanent staff during the Post Construction Phases of the project in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).

C.3 FUNDAMENTAL PRINCIPLES OF THE EMP

The EMP is based on fundamental principles² derived from applicable government policy statements contained in various government documents and legislation (e.g. the *National Environmental Management Act, (Act 107 of 1998)*). The following principles contained in various documents and laws were used as guidance during the preparation of this EMP:

- **Environmental management** must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- **The Project** must be socially, environmentally and economically sustainable, i.e. meet the “triple bottom line” criteria for project.
- **Sustainable development** requires the consideration of all relevant factors including the following:
 - ◆ that the disturbance of ecosystems and loss of biological diversity are avoided, are minimised and remedied;
 - ◆ that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
 - ◆ that the development, use and exploitation of renewable resources and the ecosystems of which they are a part do not exceed the level beyond which their integrity is jeopardised;
 - ◆ that a risk-averse and cautious approach is applied (also called the **Precautionary Approach**), which takes into account the limits of current knowledge about the consequences of decisions and actions.
- **Environmental management must be integrated**, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the *best practicable environmental option*.
- **Community well-being and empowerment** must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
- **Capacity building and education:** The EMP must play a dynamic role in developing the understanding, skills and capacity of the employees and people in the area in order to promote sustainable development.
- **Consider all alternatives:** Considering all alternatives results in making the best decisions. The EMP must therefore ensure that all alternatives are considered in all decision-making. Developmental and environmental planning, problem solving and decision-making are often complex. Possible consequences of conflicting interest as well as the consequences of not acting need careful consideration.
- **Co-ordination:** Various concerns and issues cut across the key sectors and functions in the area. Sustainability and integrated planning and management (including monitoring) therefore will depend on co-ordination and integration of all sectors and I&APs in the Richtersveld area.
- **Due process:** Due process must be applied in all integrated management activities. This includes adherence to the provisions in the Constitution and statutes dealing with just administration and public participation in regional and local governance.
- **Duty of care:** Every person (Applicant, project team, contract workers and community members) associated with the project of the rehabilitation of the Orange River Estuary have a duty to act with due care to avoid damage to the environment, or pollution of the environment or waste a precious resource. Also called the *Environmental Responsibility Principle*.
- **Equity:** The EMP is to ensure equitable access to natural resources, benefits and services to meet basic needs and ensure human well-being. Each generation has a duty to avoid impairing the ability of future generations to ensure its well-being.

² **Principles** are shared assumptions and truths that policy and action can be based upon.

- **Full cost accounting:** Decisions must be based on an assessment of the full social and environmental costs.
- **Good governance:** Good governance depends on mutual trust and reciprocal relations between the various groups and sectors of the area and the controlling officials. This must be based on the fulfilment of constitutional, legislative and executive obligations, and the maintenance of transparency and accountability.
- **Prevention:** The EMP must anticipate problems and prevent negative impacts on the environment and on people's rights.
- **Polluter Pays:** Those responsible for environmental damage must pay the repair costs both to the environment and human health, and the costs of preventative measures to reduce or prevent further pollution or degradation.
- **Subsidiary:** Regulatory responsibilities belong at the most local level at which the tasks can be carried out effectively. Environmental management structures must match the ecological scale of the managed resource.

SECTION D: CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

D.1 INTRODUCTION AND METHODOLOGY

An ECO needs to be appointed by the Applicant (Department Environment and Nature Conservation and/or Alexkor) to oversee the Construction Phase of the project. This requirement should be contained in the conditions of approval to be issued by DEA.

The ECO will then need to undertake periodic site visits to assess whether any environmental degradation is resulting from the Construction Phases of the project and to check compliance with the EMPs and with the conditions of approval to be issued by DEA. The daily on-site activities will be controlled by the Construction Manager (or Site Agent) and Resident Engineer (RE). The roles and responsibilities of the ECO throughout the contract period are provided in **Section D.1.1** below.

The EMPs contained in this EMP aim to give direction and guidance to all responsible parties, to ensure that all negative environmental impacts are mitigated, and to ensure compliance with the conditions of approval to be issued by DEA. The responsible parties during the Construction and Operational Phases of the project, all of whom will need to co-operate closely to minimise or avoid potential environmental impacts, are the Contractor (Construction Manager and/or Site Agent), RE, the Applicant, Alexkor, and the ECO.

The roles and responsibilities of the ECO, the level and type of competency required of the ECO, and frequency of site visits are outlined below.

D.1.1 Roles and Responsibilities of the ECO

In terms of the roles and responsibilities of the ECO, the ECO shall:

- regulate the various phases of the project in accordance with the Conditions of Approval issued by DEA; and the recommendations made in the BAR.
- assist the Applicant/Alexkor, the Contractor's Construction Manager (or Site Agent) and RE and with instituting the EMPs prescribed in this EMP;
- meet with the Contractor and construction teams, before construction begins, to enlighten them regarding the environmental sensitivities of the site and how to go about their construction methodology and site husbandry, so as to prevent negative environmental impacts from occurring, i.e. conduct an environmental induction training programme;
- conduct periodic site visits (as scheduled in **Section D.1.3** below) to assess any environmental degradation resulting from the project, to monitor compliance with the conditions of approval issued by DEA, and the recommendations of the EMPs (to ensure that environmental impacts are minimised and mitigated), and to assess and monitor the success of the rehabilitation programmes;
- report to the Applicant/Alexkor, Contractor's Construction Manager (or Site Agent), and RE during quarterly site meetings of progress on the implementation of the EMP, compliance with the conditions of approval and implementation of the relevant mitigation measures contained in the EMP;
- stop construction works if, in his/her opinion, there is a serious threat to or impact on the environment as a result of the construction operations;
- attend regular quarterly meetings to discuss progress of the project with the Contractor's Construction Manager (or Site Agent), and RE; and
- issue an ECO Checklist after each site meeting to act as site instructions for recording any irregularities or non-compliance with the EMPs and construction progress in general.

If the ECO at any stage indicates to the Contractor that the relevant requirements of the EMPs are not being complied with, he will issue the necessary instructions (verbally to the Construction Manager or Site Agent and in writing in the ECO Checklist) for mitigation.

If mitigation is not timeously applied and environmental degradation continues, the ECO will then instruct the RE to stop construction works until such time that the necessary measures have been satisfactorily undertaken.

The ECO will also inform the relevant officials of DEA and/or of the Richtersveld Municipality of serious non-compliance issues (if applicable). Only once all prescribed environmental control mechanisms and/or conditions of approval have been implemented to the satisfaction of the ECO will instructions be given to commence with the contract. The ECO Checklist will record any irregularities or non-compliance with the EMP. Such instructions can also be followed up with a fax to the Site Agent (Contractor).

D.1.2 Level and Type of Competency of ECO

A suitably experienced environmental practitioner, with at least 5 years relevant site supervision experience, will need to act as the ECO.

D.1.3 Frequency of Site Visits

The ECO should undertake regular site visits. Initially, the ECO will:

- attend the site handover to the Contractor and should assist in siting the site offices, storage areas and toilets;
- undertake an environmental induction training session of construction personnel;
- undertake quarterly (every three months) site visits to check on construction progress and whether any environmental degradation is taking place and whether the correct mitigation is being undertaken by the contractors to prevent such degradation. These quarterly site visits will coincide with the applicable site meetings with Applicant/Alexkor and Provincial Authority Contact Person (Mr Klaas van Zyl), Contractor's Site Agent and RE;
- attend *ad hoc* site visits should environmental problems arise during the Construction Phases, or when certain milestones have/have not been reached;

The Applicant/Alexkor is advised to retain the ECO to supervise the various construction phases of the proposed project (e.g. the removal of the earth berm, and the building of a new berm).

The ECO must undertake a completion audit once the construction of the new berm has been completed and once the removal of the whole of the existing berm has been removed. An audit of the old mine workings that will be filled with the berm material must also be undertaken, including the final rehabilitation of such restoration of such old mine workings. These audits will be undertaken to assess compliance with the EMPs and with the construction guidelines, and to ensure that satisfactory rehabilitation of the disturbed areas has taken place.

D.1.4 Environmental Induction Presentation

The ECO will facilitate an environmental induction training session (presentation) with the construction staff (foreman, machine operators, truck drivers, general employees) to familiarise them with the environmental aspects of the contract. The Contractor's Site Agent and all staff must attend this meeting. Staff will be required to complete an attendance register during this presentation.

The content of the Environmental Induction Presentation to be presented to the contractors will include:

- (i) **Introduction:** the environmental sensitivities of the site will be explained. Reinforce an environmental ethic amongst staff and explain the consequences of not complying with the conditions of approval and the content of the EMP (e.g. issuing of a stop works order).
- (ii) **Environmental Pollution:** engender an ethic of waste pollution management and how plastic bags and paper waste cause, not only visual pollution, but can lead to further salt marsh degradation, which in turn can lead to animal death if ingested by them. All solid waste must be stored in wind – proof bins to prevent waste being blown around the site. Explain also that burning of waste³ can cause toxic air pollution that is harmful to man. The importance of the use of chemical toilets will also be emphasised.
- (iii) The negative **consequences of oil and diesel pollution** will also be explained and that it is imperative to work carefully with such hazardous substances when operating construction vehicles.
- (iv) **Adherence to Speed Limits:** Speed limits of construction vehicles whilst driving in Alexander Bay must be adhered to in order to protect pedestrians, children and animals and to prevent accidents.
- (v) **Soil Erosion:** Prevent wind erosion from taking place (dust) where berm material is exposed and from haul roads. If wind erosion occurs, appropriate measures (such as wetting road surfaces, placing shade cloth on exposed surfaces) may need to be undertaken to prevent inundation of wetland vegetation or causing a nuisance in the residential area of Alexander Bay.
- (vi) **Dust Pollution:** Reasonable measures to minimise the generation of dust should be undertaken. Areas where earth is moved may require wetting with water in order to reduce dust. If dust problems persist, the affected areas may require covering with shade cloth or erecting vertical shade cloth barriers.
- (vii) **Noise Pollution:** Local by-laws and regulations in terms of noise will be enforced on site. Construction should only take place during the week during normal working hours.
- (viii) Construction vehicles and staff will **not be allowed access** to wetland areas. All vehicles must remain on the berm and designated roads and tracks at all times.
- (ix) The importance of **personal hygiene and the use of chemical toilets** will be explained to the Contractor's staff.

D.1.5 Communication Procedures on Site

A site instruction book/file should be kept on site by the appointed Contractor for the purposes of recording specific important site instructions that need immediate attention. The monthly ECO Checklist will serve as a general record of environmental contractual issues that need to be addressed in the course of the Construction Phases.

(i) Site Instruction Entries

The quarterly ECO Checklist will be used for the recording of general site instructions as they relate to the environmental scope of works on site. The site instruction book will, however, also be used for issuing “stop work” orders for the purposes of immediately stopping any particular activities of the contract due to the environmental risk or impact that may result.

³ **NOTE:** The burning of waste on site will not be permitted.

The ECO is to complete an ECO Checklist after each site visit and circulate this checklist amongst the Contractors and to the Applicant/Alexkor to serve as a record of proceedings. The ECO Checklist must be circulated no more than five (5) working days after the site meeting and the contractors must give immediate attention to any issues that need to be dealt with.

(ii) Minutes of the Site Meetings

The Minutes of each monthly construction site meeting must be forwarded to the ECO, Contractor and Applicant/Alexkor by the RE within one week of the meeting taking place. The minutes of the meeting must record any environmental issues that have been raised by the ECO and that need to be addressed or rectified.

(iii) Method Statements

Method statements from the Contractor may be required for specific sensitive activities. A method statement forms the baseline information for work that takes place in sensitive areas or under sensitive conditions and is a “live document”, i.e. modifications can be negotiated between the Contractor and ECO/RE as circumstances unfold. All method statements will form part of the EMP documentation and are subject to all terms and conditions contained within the EMP.

D2: GENERAL MANAGEMENT PROGRAMME OF CONSTRUCTION

ENVIRONMENTAL POLICY:		
Before and during the removal and the construction of the Earth Berms in the Orange River Estuary on Farm Rem/625 it must be ensured that all negative environmental impacts are mitigated to prevent any temporary or permanent environmental impacts or effects and ensure the safety and good health of all construction staff.		
OBJECTIVE:		
To control all aspects of the Construction Phase (removal and construction of a berm) by implementing the necessary mitigation and recommendations to prevent any temporary or permanent negative environmental impacts from occurring.		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Establish appropriate partnerships and good relationships with local authorities, local community and contractors/staff.	<ol style="list-style-type: none"> 1. Ensure appropriate communication with all local authorities, local communities, and contractors. 2. Contractors to be fully informed by the ECO as to their environmental contractual obligations. 3. The ECO to give an environmental induction training (presentation) to Contractor and site staff to familiarise them with the environmental aspects of the contract and that they are aware of the various environmental requirements. The Contractor and staff must attend this meeting. The environmental induction training must address the management of sanitation facilities (chemical toilets) and general site management. The site must be managed appropriately and all rubbish and rubble must be collected in appropriate waste receptacles and disposed of at the nearest landfill site. The induction training must address keeping noise to a minimum and labourers general conduct. 4. Appropriate signage that indicates the contact details of the Applicant (and Provincial Authority Contact Person), Contractor, RE (or RE's representative) and ECO must be provided on site. 	<p>To be undertaken by professional team and ECO, project manager (consulting engineer and/or site agent) as an on-going process. ECO to monitor environmental contractual obligations of contractors on an on-going basis. ECO and RE to meet with Contractor and staff before construction commences to initiate the EMP.</p> <p>Applicant (and Provincial Authority Contact Person)/Contractor to ensure that appropriate signage is put in place.</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>2. Set up of construction site and site offices and undertake construction and earthworks without adversely affecting the environment</p>	<ol style="list-style-type: none"> 1. Communicate with Contractor to ensure that all the environmental specifications are understood and carried out. 2. The Contractor must point out and demarcate the construction site and site offices. This area should be fenced off (screened), and should be locked outside working hours. 3. The construction site shall be contained in an area required to undertake the work and must be pointed out to the Contractor. Any area beyond shall be considered "no go" areas. The Contractor shall ensure that, insofar as she/he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas. "No go" areas shall be clearly demarcated with appropriate markers (e.g. wetlands, salt marshes). 4. The Contractor shall maintain the construction site boundary for the duration of construction and ensure that the markers do not become dislodged. 5. Control all construction in terms of the Construction Guidelines (refer to Appendix 1) and in terms of the content of this EMPr. 6. Construction material must be stored in designated areas in a neat and orderly manner. 7. Contractor to remove earth berm material to suitable dumping areas (e.g. old mine areas to be rehabilitated). Such areas are to be clearly designated by Alexkor personnel. 8. The old mine workings to be rehabilitated must be inspected by the ECO prior to the dumping of any spoil. 9. Trucks removing soil must remain on designated access road/s. Access road/s must be well maintained. 10. Road construction signs to be erected along appropriate roads. 11. Driving regulations through Alexander Bay and on site must be adhered to at all times. 	<p>To be undertaken by ECO and site agent before construction commences.</p> <p>To be sanctioned by the ECO before construction begins.</p> <p>Area for construction material to be designated by the ECO and to be in secured area ECO and/or RE to monitor compliance. ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>Area for storage of construction materials and equipment to be designated by the ECO/RE.</p> <p>ECO and/or RE to assess spoil dumping site, and to monitor filling and condition of road/s.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>2. Set up of construction site and site offices and undertake construction and earthworks without adversely affecting the environment (continued)</p>	<p>12. Personal Protective Equipment must be provided to ensure safety of workers and adequate facilities must be provided to ensure that relevant minimum standards apply to working conditions. Working conditions must be in line with the requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).</p> <p>13. Wherever blasting activity is required, the Contractor shall adhere to the relevant statutes and regulations that control the use of explosives.</p> <p>14. All solid waste to be kept in appropriate weather and scavenger proof containers and removed from the site by the Contractor on a weekly basis to a licensed waste disposal facility. The burning of solid waste and paper on site will not be allowed. Recyclable waste (e.g. paper, glass, tin, plastic) should be recycled if possible.</p> <p>15. At all places where construction takes place, the Contractor shall provide litter bins, containers and refuse collection facilities for later safe disposal to approved sites. Recyclable waste (e.g. paper, glass, tin, plastic) should be recycled if possible. To this extent, separate bins should be provided and workers should be educated regarding recycling.</p> <p>16. The Contractor shall ensure that at work closure at the end of every work day the site is left in a clean and safe condition overnight or over periods when there is no construction activity.</p> <p>17. The requirements of the National Environmental Management: Waste Act (Act No. 59 of 2008) must be adhered to throughout the construction and operational phases of the development. Disturbed areas where dust can arise should be kept moist by spraying with water from a water bowser.</p>	<p>Health & Safety Officer to monitor throughout contract period.</p> <p>Safety Officer to monitor working conditions and safety throughout. ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>Contractor to remove solid waste on a weekly basis. ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>3. Prevent possible negative impacts of construction personnel on the environment</p>	<ol style="list-style-type: none"> 1. Contractors will be responsible for the conduct of their personnel on site, as it pertains to trespassing, littering, and unacceptable social behaviour. 2. During the construction period, the facilities shall be maintained in a neat and tidy condition and the site shall be kept free of litter. 3. ECO must inform construction personnel of environmental rules to apply during construction period. 4. The RE must maintain strict supervision over all construction activities. 5. All construction workers should stay within the development area demarcation, and not trespass onto sensitive areas (wetlands). 6. The Contractor must provide temporary chemical toilet facilities at the stores/site office area when building work is being conducted there. A minimum of one toilet shall be provided per 15 persons at each working area or as stipulated by the local authority. The toilets must be kept in a clean and sanitary condition, and must be regularly serviced i.e. at least once a week. 7. Chemical toilets may not be positioned closer than 50m from any water course, shall be provided with locks and doors and shall be secured to prevent them from blowing over. 8. Construction staff will not be allowed to stay on site and should be bussed to site each day. 9. Security personnel may be required to be on site during nights and weekends. 10. The contractor shall maintain a complaints register on site. 	<p>Contractor responsible for social management. RE to monitor compliance.</p> <p>ECO and/or RE to monitor Contractor's compliance for duration of contract. No littering by construction workers will be allowed. ECO to meet with Contractor prior to commencement of construction in new areas to inform workers of the sensitivities of the site and how they should conduct themselves.</p> <p>ECO to monitor construction activities and if any adverse impacts occur, he must inform the Site Agent, RE and client of such conduct on an on-going basis.</p> <p>ECO to monitor for duration of contract.</p> <p>ECO and/or RE to monitor Contractor's compliance for duration of contract.</p> <p>ECO and/or RE to monitor Contractor's compliance for duration of contract.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO and/or RE to monitor compliance.</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>4. Ensure appropriate training of staff to prevent accidents and ensure health and safety of staff on site</p>	<ol style="list-style-type: none"> 1. The Contractor is to ensure that the working conditions on site adhere to the minimum requirements of the Occupational Health and Safety Act (Act No. 85 of 1993). 2. The appropriate training of staff must be given to prevent accidents and the appropriate protective gear is to be issued. 3. Safe drinking water for human consumption shall be available at the site offices and at other convenient locations on site. All water used on the site must be taken from a legal source and comply with recognized standards for potable and other uses. 4. If water is stored on site, distinction shall be made between drinking water and multi-purpose water storage facilities. 	<p>The Site Agent is to ensure compliance and that a Health and Safety official is appointed to undertake the necessary audits to ensure compliance.</p> <p>The Site Agent is to ensure that appropriate training and protective gear is given to personnel for specific tasks.</p> <p>Safety Officer to monitor compliance.</p> <p>Safety Officer to monitor compliance.</p>
<p>5. Ensure that the Construction Phase meets the required performance criteria</p>	<ol style="list-style-type: none"> 1. Inform all contractors and their staff of the performance criteria. 2. Institute and maintain a monitoring programme of construction performance. 3. Monitor quality control of construction work. 4. Ensure that contractors adhere to the guidelines in respect of littering, sanitation, spills of toxic substances and general behaviour. 	<p>Site Agent to inform</p> <p>Site Agent to monitor on a daily basis and inform client of any time delays or non-performance during contract period.</p> <p>Site Agent to monitor on a daily basis</p> <p>ECO/RE to monitor compliance and any significant impacts.</p>

D.3 BIOPHYSICAL MANAGEMENT PROGRAMMES DURING CONSTRUCTION

ENVIRONMENTAL POLICY:

Conserve all aspects of the environment around and on the site, which includes the following:

- Conservation of natural systems and natural habitats (wetlands/salt marshes).
- Prevention of soil erosion and dust.
- Remove alien vegetation from site (if required).
- Reduce the risk of potential fires occurring within riparian fringe.
- Prevention of environmental pollution.

D.3.1 Fauna and Flora Management

OBJECTIVE:

To conserve indigenous plants and animals that may occur within and around the proposed project site.

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Minimise the removal of any vegetation during the construction phase	<ol style="list-style-type: none"> 1 Remove only the bare minimum of vegetation for construction purposes. 2 Where appropriate stockpile topsoil removed from the construction area in suitable designated areas for later use in the rehabilitation of the site. 3 Stockpiling of topsoil must not exceed a height of 2m above ground level. Topsoil stockpiles should be covered with a suitable material (or seeded with a suitable indigenous grass species) to prevent them from being windblown or contaminated, if stockpiled for longer than 6 months. 	<p>ECO and/or RE to monitor compliance. The construction area must be clearly demarcated by the Contractor</p> <p>Designated areas for storage topsoil to be ratified by the ECO at start of contract.</p> <p>ECO to monitor compliance, and to advise accordingly.</p>
2. Institute an alien vegetation removal programme for the remainder of the farm.	<ol style="list-style-type: none"> 1. Alien vegetation must be removed by appropriate means. 2. An alien invasive management plan to be implemented during construction and post construction on the site. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken. 	<p>Methods for on-site alien plant removal are to be advised by the ECO, if required. Guidelines for alien vegetation management are attached as Appendix 2.</p> <p>The Management Entity to monitor on continuous basis when contract period complete.</p>
3. Institute a vegetation rehabilitation programme for disturbed and degraded areas on the site.	<ol style="list-style-type: none"> 1. Plant rescue and protection plan to be implemented during construction and post construction which allows for the maximum transplant of conservation important species from areas to be transformed. 	<p>ECO to implement plans.</p> <p>The Management Entity to monitor on continuous basis when contract period complete.</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>Institute a vegetation rehabilitation programme for disturbed and degraded areas on the site (continued)</p>	<ol style="list-style-type: none"> 2. A re-vegetation and habitat plan to be implemented during the removal of the berm including timeframes for restoration which must indicate rehabilitation within the shortest possible time after completion of construction activities to reduce the amount of habitat at any one time and to speed up the recovery to natural habitats. 3. Allow natural succession of indigenous vegetation to occur. 4. The vegetation rehabilitation programme must be approved by Conservation Committee (DE&NC) prior to implementation. 	<p>DE&NC to compile as part of the restoration programme for the estuary.</p> <p>DE&NC to monitor as part of their restoration programme DE&NC to monitor. The Management Entity to monitor on continuous basis when contract period complete.</p>
<p>4. Monitor all aspects of the vegetation rehabilitation programme on site</p>	<ol style="list-style-type: none"> 1. Institute a monitoring programme to assess the success of the vegetation rehabilitation programme. 	<p>DE&NC to monitor rehabilitation. The Management Entity to monitor on continuous basis when construction contract period complete. Corrective measures are to be taken based on success of rehabilitation programme.</p>
<p>5. Minimise disturbance to fauna</p>	<ol style="list-style-type: none"> 1. Contractors must not harm or disturb any wildlife, especially mole rats, snakes, tortoises, lizards and birds. 2. Mole rats, snakes, tortoises and other animals must be physically removed from the construction site without harming them and taken to an appropriate location. Only competent snake handlers must be employed to move snakes, should it be necessary. 	<p>ECO and/or RE to monitor compliance. The Contractor must report all incidents of harm to any fauna to the ECO.</p> <p>ECO and/or RE to monitor compliance.</p>
<p>6. Take the necessary measures to reduce the risk of fire on the property</p>	<ol style="list-style-type: none"> 1. Staff should only smoke within demarcated areas. Cigarette butts must be disposed of in the lidded waste bins provided. Waste bin lids must be replaced if these are lost. 2. No fires will be allowed on the site unless authorised by the Safety Officer. 	<p>ECO, Safety officer and Contractor to monitor.</p> <p>ECO, Safety Officer and Contractor to monitor.</p>

D.3.2 Water Management

OBJECTIVE:		
To ensure the conservation and sustainable use of scarce water resources by instituting measures to minimise water use during the Construction Phases of the project, including awareness programmes to educate workers on the efficient use of potable water.		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Institute measures to minimise potable water use during the Construction Phases of the project	<ol style="list-style-type: none"> 1. No pollution of surface or ground water may occur due to any activity on the properties. The relevant requirements of the National Water Act, 1998 (Act No. 36 of 1998) must be complied with at all times. 2. Wastewater, which is contaminated with soaps, detergents, grease, oils and other undesirable materials shall be collected in conservancy tanks and disposed of safely into a wastewater treatment facility. 3. Contractors must use water sparingly, e.g. use optimum moisture conditions for berm construction. All leaking taps and valves need to be replaced as soon as their malfunction has been noticed. Should dust become a nuisance to surrounding residents, efficient use of water to wet dusty surfaces should be employed. 	<p>ECO/RE to monitor throughout the construction period.</p> <p>ECO and/or RE to monitor compliance.</p> <p>ECO/RE to monitor throughout the construction period.</p>

D.3.3 Soil Management

OBJECTIVE:		
To ensure the conservation of the soil on Farm Rem/625 during the removal of the berm and the rehabilitation of the Orange River Estuary, and institute measures to prevent soil erosion and pollution (contamination of soil and dust) from taking place.		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Prevent soil erosion	<ol style="list-style-type: none"> 1. All construction vehicles and machinery and equipment must be properly maintained to prevent oil and diesel leaks. 2. Only remove vegetation immediately prior to soil stripping and / or site preparation in order to minimise the time the soil is bare, thus minimising soil erosion and dust impacts. 3. Where wind erosion takes place areas should be wetted down or shade cloth should be used to slow down the wind. 	<p>ECO and/or RE to monitor compliance.</p> <p>ECO to monitor site clearing and site preparation and check for any erosion that may take place. Anti-erosion measures to be approved by the RE in consultation with the ECO if and when necessary.</p> <p>As above</p>

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>2. Rehabilitate all areas disturbed during the construction phase of the project and/or where soil erosion has taken place.</p>	<ol style="list-style-type: none"> 1. Institute soil protection and soil rehabilitation measures where erosion has taken place (e.g. through shaping of cut and fill slopes to the satisfaction of the RE). 2. Earth fill will eventually need to be excavated from the old channels to allow wetland vegetation to grow. 3. Areas devoid of vegetation which will remain above the excavated old river channels which will be prone to erosion should be covered with windbreaks (shade netting fences of about 900mm high and spacing of 3 to 5m apart). Indigenous grasses and riparian fringe vegetation should eventually be planted in these areas. 4. Level the disturbed area to resembling its natural profile. The surface should be left bumpy rather than flat to maximise potential for collection of fog, for moisture, and windblown seed in pockets to serve as regeneration and dispersal nodes. 	<p>To be planned and facilitated by RE / ECO when necessary.</p> <p>Contractor to ensure that the backfilled material is compacted sufficiently so as to not collapse in the future.</p> <p>ECO to monitor and advise accordingly.</p>

<p>3. Prevent pollution/contamination of soil</p>	<ol style="list-style-type: none"> 1. Should cement of concrete be required during the construction of the new earth berm, cement spills must be cleared as soon as possible as cement powder has a high alkalinity pH rating that can contaminate and affect both soil and water pH dramatically. This will have negative impacts on surrounding vegetation. 2. All refuelling and servicing of vehicles must have a drip tray to prevent accidental spillage of oils and fuels. Similarly any concrete mixers, dumpers, compressors or generators must have drip trays under them. 3. All vehicles, equipment and fuel tanks (e.g. trucks, excavators) must be maintained in a good condition that prevents leakages and potential contamination of soil. 4. All oils, fuels, other hydro-carbons and other potentially hazardous materials must be stored in an impermeable concrete bunded area, designed to be able to accommodate 110% of the volume of the materials stored therein. Alternatively, such potentially hazardous materials may be temporarily stored on drip-trays. Such stored materials must be kept locked when not in use. 	<p>ECO to monitor for duration of contract. Contractor to inform ECO of such spills.</p> <p>ECO to monitor for duration of contract.</p> <p>ECO to monitor for duration of contract.</p> <p>ECO to monitor for duration of contract.</p>
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D.3.4 Dust Management

<p>OBJECTIVE: To prevent any impacts on air quality, such as dust pollution, that could arise during the construction phase of the project.</p>		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
<p>1. Institute measures to minimise dust pollution during the construction and post construction phases of project</p>	<ol style="list-style-type: none"> 1. The bare minimum of vegetation must be removed during construction to prevent windblown dust from being generated. 2. Dirt tracks and gravel roads used as haul roads for the removed earth berm material should be kept moist where necessary, by spraying water on such surfaces during windy periods to prevent dust formation. 3. Any stored earth material removed from the berm from which dust could be generated, should be covered with shade cloth during windy periods to prevent dust from being generated. 	<p>ECO/Contractor to monitor throughout the construction period.</p> <p>ECO/Contractor to monitor throughout the construction period.</p> <p>ECO/Contractor to monitor throughout the construction period.</p>

D.3.5 Noise Control

OBJECTIVE: To prevent and/or minimise noise pollution impacts that could result during the construction phase.		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Vehicle movement.	1. Vehicles operating on site should be fitted with efficient silencers and must be well-maintained.	ECO/Contractor to monitor throughout the construction period.
	2. Noise generation will be limited to the normal construction activities associated with construction vehicles during normal working hours.	ECO/Contractor to monitor throughout the construction period.

D.3.6 Solid Waste and Waste Management

OBJECTIVE: To ensure waste minimisation and recycling of waste at source, where possible, and to ensure an ethic of waste management amongst construction and rehabilitation staff.		
PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Solid waste generation during the construction phase.	<ol style="list-style-type: none"> The earth-fill material removed from the earth berm (at Location A), will be used to construct the proposed new flood protection berm (at Location B). The earth-fill material will be excavated by a mechanical excavator and placed into a dump truck which will transport the fill to the site of the proposed new berm. Fill removed from the berm (at Location A) will also be used to fill in old alluvial diamond mine excavations around Alexander Bay and at the old mine workings within Alexkor. The excavated material from the berm must be assessed for any material that could potentially cause pollution where it is used for fill. Any potentially pollutant material unearth must be disposed of at a licenced waste disposal facility. 	<p>ECO/Contractor to monitor throughout the construction period.</p> <p>ECO/RE to supervise</p>
2. Contractor to monitor waste minimisation and recycling	<ol style="list-style-type: none"> An integrated waste management approach must be used that is based on waste minimisation and must include reduction, recycling, re-use and disposal where appropriate. Waste bins must be used on site. The bins must have lids and an external closing mechanism to prevent scavenging and/or contents blowing out. All waste must be deposited in the waste bins for removal. The bins must not be used for any other purpose than waste collection and must be emptied on a regular basis by the contractor at a registered waste disposal facility. Any solid waste should be disposed of at a waste disposal facility licensed in terms of Section 20 of the Environment Conservation Act, 1989 (Act No. 73 of 1989). No solid waste is to be burnt on site. 	<p>Contractor to provide guidance engendering an ethic of recycling amongst workers. ECO to monitor.</p> <p>Contractor/ ECO to monitor.</p> <p>Contractor/ ECO to monitor.</p> <p>Contractor/ ECO to monitor.</p> <p>Contractor/ ECO to monitor.</p>

D.4 SOCIO-ENVIRONMENTAL MANAGEMENT PROGRAMMES DURING CONSTRUCTION

ENVIRONMENTAL POLICY:

To enhance all aspects of the social environment during the construction phase of the project by adopting a Richtersveld first policy when employing construction companies and staff to ensure that the socio-economic benefits accrue to the Richtersveld area.

D.4.1 Socio-Economic Benefits of the Development

OBJECTIVE:

Undertake removal of the berm and the rehabilitation of the wetlands, salt marshes and ancient channels of the Orange River to ensure sustainability by optimising the social benefits of the development, by employing local truck drivers and contractors for the removal of the berm, construction of new berm and ultimately during the the rehabilitation phases.

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Job Opportunities	<ol style="list-style-type: none"> Both the temporary job opportunities during the construction phase and more permanent jobs during the rehabilitation phases should be allocated to persons from the local communities wherever possible. Local business should be supported, with respect to the appointment of contractors, hire of machinery, and the purchase of goods and materials, where possible. Train staff during construction and rehabilitating operations so that their skills would make them employable in other sectors of the local economy. Re-deploy staff to other projects (such as rehabilitation). Give ample warning to local community to seek alternative opportunities when contracts are nearing closure. 	<p>Applicant (and Provincial Authority Contact Person) and/or RE should monitor the local employment strategy together with the appointed Contractors.</p> <p>RE/Alexkor to monitor compliance where necessary.</p> <p>RE/Alexkor to monitor compliance where necessary</p> <p>Alexkor</p> <p>Contractor</p>

D.4.2 Security

OBJECTIVE:

To maintain and/or enhance security levels around the project site, during Construction

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Minimise security risks during the Construction Phase	1. The Contractor(s) will be responsible for the security of their construction site and the conduct of their personnel for the duration the contract.	The Contractor and Applicant (and Provincial Authority) / RE will need to implement and monitor security steps to be taken.

D.5 ARTIFICIAL BREACHING MANAGEMENT PROGRAMME DURING CONSTRUCTION (LOCATION C)

MOUTH MANAGEMENT AND BREACHING GUIDELINES (CSIR, 2005)

OBJECTIVE:

Proposed artificially breaching of the sand berm in the Orange River Mouth (**Location C – Figure 1 and 7**). The sand berm that has developed in the southern, flood meander channel of the Orange River near its mouth also needs to be artificially breached to reduce the salinity levels that are currently building up in this cut-off channel. These high salinity levels are having a devastating impact on the ecology of this section of the estuary.

About 70% of South Africa's estuaries are temporarily open/closed systems, this means that they naturally go through cycles of closed and open mouth conditions. These cycles are punctuated by breaching events, which in turn are related to fluctuations in water levels, salinity regimes and changes in the ecology. It is therefore recommend that, as far as possible, an estuary should be managed to its natural breaching rhythms to ensure a healthy, functional estuary.

Artificial mouth management should therefore not lightly be undertaken and decisions to breach the mouth should take all the relevant aspects into account (CSIR, 2005).

Unfortunately, artificial breaching is often required when:

- **The runoff to an estuary has been so reduced that it does not reach its optimum breaching levels, or breaching is occurring so late in the year that biological functioning (e.g. migration of invertebrates and fish) are impaired;**
- **Modifications at the mouth area (e.g. dune stabilization, mouth canalization) interferes with the natural breaching dynamics or patterns (e.g. increased berm height or closed for longer periods);**
- Low-lying developments (e.g. houses, stormwater drains or causeways) are inundated for long periods and may incur structural damage;
- Potential flooding to surrounding developments; and
- Water quality problems (e.g. algal blooms, *E. coli* counts) develop.

Artificial breaching can have the following detrimental impacts on an estuary:

- Disturbance of the mouth conditions can lead to reduced/no recruitment of estuarine invertebrates and juvenile fish;
- Die-back of estuarine vegetation due to long periods of inundation or insufficient flushing of accumulated salt from the surrounding sediment;
- Breaching at low levels often cause long-term sedimentation problems; and
- Loss of productivity because of artificially low water levels in the estuary, i.e. high water levels during the closed phase in small estuaries coincide with an increase in productivity.

The procedures and requirements that follow are in order of importance. Not all of them are always achievable or advisable.

RECOMMENDATION FOR BREACHING	REASON FOR RECOMMENDATION	TARGET & RESPONSIBILITY
<p>1. If possible breaching should occur naturally</p>	<p>Natural breaching in a pristine system provides the natural variation on which the ecology of the estuary depends for its survival. This is often not possible anymore because of developments in the flood plain of the estuary or river, large impoundments preventing annual flooding events, etc. To protect houses, artificial breaching is practised, often at very low water levels. This practise can result in considerable sedimentation and disruption to the ecology of the estuary. Developments, such as the sewerage works near Alexander Bay and the golf course near Oranjemund have also resulted in the practise of artificial breachings at lower water levels at the Orange Estuary. However, it is important for example for the restoration of the saltmarsh that effective backflooding can occur.</p>	<p>DE&NC, DEA, NA-MET, Working for Waters, ORASECOM, DWA, ECO and Safety Officer from Alexkor. To guide and monitor compliance by Contractors.</p>
<p>2. Water level should be as high as possible</p>	<p>The reason for this is that as much sediment as possible should be flushed from the mouth and from the estuary. The potential of flushing of sediments increases exponentially with the increase of outflow velocities after breaching, which in turn increase strongly with the increase in water levels. In the case of the Orange River Estuary the major benefit of elevated water levels before breaching would be the backflooding of less saline water into the higher saltmarshes to reduce soil salinities. This guideline is therefore of high importance to ensure effective backflooding for the Orange River Estuary. Natural breaching of the mouth of estuaries along the South African coast would normally occur at water levels of between + 2.8 and + 3.5 m MSL. However, for more than a hundred years, the estuarine mouths have often been breached at water levels that are much lower. This has probably resulted in considerable sedimentation of the mouth area. It is important that artificial breaching takes place using large mechanical excavators.</p>	<p>DE&NC, DEA, NA-MET, Working for Waters, ORASECOM, DWA, ECO and Safety Officer from Alexkor. To guide and monitor compliance by Contractors.</p>
<p>3. A deep and wide trench should be excavated before breaching</p>	<p>A considerable amount of water is sometimes needed to flush open a small, narrow trench to a medium sized trench. A larger initial trench will result in higher flow velocities and more sediment being flushed out to sea.</p>	<p>DE&NC, DEA, NA-MET, Working for Waters, ORASECOM, DWA, ECO and Safety Officer from Alexkor to guide and monitor compliance.</p>

RECOMMENDATION FOR BREACHING	REASON FOR RECOMMENDATION	TARGET & RESPONSIBILITY
A deep and wide trench should be excavated before breaching (continued)	This guideline may not be especially relevant to the Orange Estuary, where the river flow is most of the time strong enough to prevent significant influx of marine sediments and the volume of the estuary is large.	
4. Breaching to take place at high tide or as close after high tide as possible	<p>The actual moment of breaching during the tidal cycle should be at high tide or, if permitted by the wave regime, as close after high tide as possible. High waves can sometimes interfere with the breaching process at high tide and shortly after high tide. It is therefore important to watch the effect of the waves in front of the mouth. The mouth can be breached as soon as it is considered that the waves will no longer interfere significantly.</p> <p>The high outflow after breaching which causes the scouring, lasts over several hours and often more than a tidal cycle. The maximum outflow normally occurs approximately 4 to 8 hours after a breaching and the flow velocities will be increased if there is a greater difference in water levels between the estuary and the sea (prism). The breaching of a mouth can become difficult and sometimes even impossible when the waves are very high. In such conditions and if direct problems because of flooding do not exist, it may be better to postpone the breaching by a few days.</p>	DE&NC, DEA, NA-MET, Working for Waters, ORASECOM, DWA, ECO and Safety Officer from Alexkor to guide and monitor compliance by Contractors.
5. The position at which a mouth should be breached	<p>There is often considerable controversy concerning the location where a mouth breaching should take place. The position of an estuary mouth differs from estuary to estuary and the breaching time at a specific estuary.</p> <p>Consistency in the breaching position is advised as it often has the benefit of creating well established ebb and flood channels, facilitates future breaching and creates a stable salinity regime in mouth areas.</p> <p>In the case of the Orange River Estuary, breaching to the south is recommended as this will allow for subsequent flushing of saline water from and into the saltmarsh area. An increase in salt water penetration in the protected backwater areas, near the mouth on the south side, would increase the available estuarine area and potentially, the productivity of the system.</p>	DE&NC, DEA, NA-MET, Working for Waters, ORASECOM, DWA, ECO and Safety Officer from Alexkor to guide and monitor compliance by Contractors.

In general, it should be recognized that an estuary mouth is highly dynamic and unforeseen events may require special management actions. Ideally a range of different scenarios should be considered, compared, and appropriate actions planned.

It should also be noted that the mouth of the flood channel to the south of the mouth can also silt up, causing hypersaline conditions in the flood channel, which is then cut off from the main Orange River channel. It is important to breach this sand berm that develops across this flood channel to flush out hypersaline water to provide fresher, sea water (**Figure 1 and 7**). It is this channel that currently requires breaching to improve the condition of the salt marshes associated with this flood channel.

SECTION E: POST-CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL POLICY:

The Post Construction Phase of the proposed Removal of the earth berm within the Orange River Estuary must ensure that all potentially negative environmental impacts are suitably mitigated to prevent any temporary or permanent environmental impacts or effects from occurring.

OBJECTIVE:

To control all aspects of the Post Construction Phase of the development by implementing the necessary mitigation and recommendation measures to prevent any temporary or permanent negative environmental impacts from occurring and preventing the rehabilitation of the original wetlands and channels of the Orange River Estuary from taking place.

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Post-construction site rehabilitation	1. All temporary structures used for the construction phase are to be removed from the site within three weeks after completion of the successful removal of the berm and the construction of the protection berm around the sports fields and low-lying sections of Alexander Bay.	The ECO will monitor the post-Construction Phase of the project to ensure that degradation of the environment has not taken place, surfaces are properly rehabilitated and all remaining litter and earth berm material has been picked up.
	2. The Contractor must remove any remaining materials within one week after completion of the project, to an appropriate licensed dumping site.	ECO and/or RE to monitor compliance.
	3. No remaining berm material must be on the site, and all areas where the berm once stood must be scarified and left in a neat and clean state.	ECO and/or RE to monitor compliance.
	4. The Contractor must repair disturbed areas (e.g. deep tracks left by construction vehicles) within one week after completing the project.	ECO and/or RE to monitor compliance
	5. The ECO is to undertake and environmental audit of the project within the first week after the contract has been completed to ensure that all the contractual obligations have been completed. The final site inspection will take place with the contractor, RE, DE&NC and Alexkor. Any follow-up rectification work must be immediately carried out.	ECO to undertake such audits.

As noted above, this EMP only encompasses the removal of the existing earth berm and the construction of the required berm to protect the sports field and the low-lying areas of Alexander Bay facing onto the Orange River Estuary. It is not the intension of this EMP to promote for the rehabilitation of the old flood channels of the Orange River that were filled in for the construction of the old berm, the rehabilitation of the associated wetlands, and those section of the old flood channels that were used for the sewage maturation ponds and the breaching of the mouth of the Orange River or the breaching of the sand bar across the flood channel to the south of the mouth of the Orange River.

Such management and rehabilitation must be undertaken in terms of the *Strategic Management Plan for the Orange River Mouth Ramsar Site*. (Macfarlane, D.M. (2013). Strategic Management Plan for the Orange River Mouth Ramsar site. Version 0.5. Report prepared for the United Nations Office for Project Services (UNOPS)).

Nevertheless, it is recommended that an **alien vegetation removal programme** is instituted as soon as possible for the riparian fringe and old flood plain of the estuary.

Such alien vegetation, comprising Blue Gum trees and any invasive Acacia trees must be removed by appropriate means.

Methods for on-site alien plant removal should be undertaken in accordance with the guidelines for alien vegetation management attached as **Appendix 2**.

SECTION F: THE WAY FORWARD AFTER IMPLEMENTATION OF THIS EMP

The Rehabilitation Phase of the Orange River Estuary and its long term management which encompasses the rehabilitation of the old flood channels and their associated wetlands and saltmarshes on Farm Rem/625, and the breaching of the Orange River Mouth and its flood channel to the south of the mouth is to be undertaken in terms of the *Strategic Management Plan for the Orange River Mouth Ramsar Site*, and in terms of relevant legislation (refer to the list below). The Management Entities for this Strategic Management Plan will be DEA, DE&NC, Working for Wetlands, CPA, Alexkor and DWA.

The *Strategic Management Plan for the Orange River Mouth Ramsar Site* is not an isolated plan. This strategic management plan is intended to be a high-level, strategic five year document that provides the direction for the management of the Orange River Mouth Ramsar site.

To be effective and sustainable the Management Plan must be embedded in overarching international, national, regional and local plans. Once the strategic planning phase has been completed this then feeds into the implementation phase. Here, operational plans (annual plan of operation) are to be developed by relevant role players together with more detailed action plans and associated budgets. Once approved, these plans will then be implemented and outcomes monitored accordingly.

At the international level, this requires close interaction with existing institutional structures and plans. This includes the Orange River Integrated Water Resources Management Plan of the Orange-Senqu River Commission (ORASECOM) and the Lower Orange River TFCA.

At the regional level, this plan needs to be integrated into and aligned with conservation and land-use planning such as regional Land Use Management Plans in South Africa and the Sperrgebiet National Park Management Plan in Namibia.

At the local level the Orange River Mouth Ramsar Site Management Plan must be embedded in the district and local level municipal spatial and economic planning. Ensuring strategic alignment of these plans will be critical in ensuring the effective management of the Orange River Mouth Ramsar site. The management plan in terms of NEMPAA has been completed and the South African Ramsar management plan has been accepted by the Ramsar bureau. The Ramsar management plan must be adjusted to the format of the National Estuarine Management Protocol as an Estuarine Management Plan.

When developing a management plan, it is important that this be located within the context of a legal framework. For a transboundary site of this nature, the applicable legal framework is both extensive and complex. In South Africa alone the environmental legislation applicable to wetlands and estuaries is vast. Referring to Taljaard (2007) potentially 16 international conventions, 10 white papers, over 40 National Acts, provincial legislation and local by-laws governs some aspect of South Africa's estuaries. A list of some of the most important legislation in South Africa and Namibia is provided below:

International Conventions

- Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971) (Ramsar Convention)
- United Nations Convention on the Law of Non-navigational Uses of International Watercourses (1997)
- Convention of Migratory Species of Wild Animals (1979)
- United Nations Convention on Biological Diversity (1992)
- The African-Eurasian Waterbird Agreement (1995)
- The protocol for Wildlife Conservation and law Enforcement (1999)
- South African Development Community (SADC) Revised Protocol on Shared Watercourses

(August 2000)

- Agreement between Botswana, Lesotho, Namibia and South Africa on the establishment of the
- Orange-Senqu River Commission (ORASECOM) (November 2000)
- Agreement on the Violsdrift and Noordoewer Joint Irrigation Scheme between the Government
- of the Republic of Namibia and The Government of the Republic of South Africa (1992)
- Agreement between the Government of the Republic of South Africa and the Government of the Republic of Namibia on the Establishment of a Permanent Water Commission (1992)

- ***National Legislation – South Africa***

- Conservation of Agricultural Resources Act, No. 43 of 1983
- Constitution of the Republic of South Africa Act, No. 108 of 1996
- Disaster Management Act, No. 57 of 2002
- Environment Conservation Act, No. 73 of 1989
- Labour Relations Act, 1995 Act, No. 66 of 1995
- Local Government: Municipal Systems Act, Act 32 of 2000
- Marine Living Resources Act, No. 18 of 1998
- Mineral and Petroleum Resources Development Act, No. 28 of 2002
- National Environmental Management Act, No. 107 of 1998
- National Environmental Management: Biodiversity Act, No. 10 of 2004
- National Environmental Management: Integrated Coastal Management, No. 24 of 2008
- National Environmental Management: Protected Areas Act, No. 57 of 2003
- National Heritage Resources Act, No. 25 of 1999
- National Veld and Forest Fire Act, No. 101 of 1998
- National Water Act, No. 36 of 1998
- Occupational Health and Safety Act, No. 85 of 1993
- Public Finance Management Act, No. 1 of 1999
- Sea Birds and Seals Protection Act, No. 46 of 1973
- Sea Shore Act, No. 21 of 1935
- Water Services Act, No. 108 of 1997
- World Heritage Convention Act, No. 49 of 1999

National Legislation – Namibia

- Draft Wetland Policy (2004)
- Environmental Management Act (No. 7 of 2007)
- Inland Fisheries Resources Act (No. 1 of 2003)
- Local Authorities Act (No. 23 of 1992)
- Minerals (Prospecting and Mining) Act (No. 33 of 1992)
- Marine Resources Act, 2000. (No. 27 of 2000)
- Namibia Water Corporation Act (No. 12 of 1997)
- Nature Conservation Ordinance 4 of 1975 (Amended in 1996)
- The Town Planning Ordinance (Act 18 of 1954)
- Water Resources Management Act (No. 24 of 2004)

SECTION G: ENVIRONMENTAL AUDITING

ENVIRONMENTAL POLICY:

Environmental auditing is to be instituted and maintained as a fundamental management function for revising the management programmes and procedures required for the management of the proposed project for the removal and construction of a berm in the Orange River Estuary, during the Construction Phase, i.e. removal of the existing berm and construction of a new berm to protect the low-lying areas of Alexander Bay.

OBJECTIVE:

To maintain scheduled monitoring and supervision over all management activities to ensure optimal professionalism, productivity, and cost-effectiveness in all work spheres, whilst ensuring environmental sustainability. This specifically refers to the following:

- achieving all the set goals and objectives;
- ensuring that the set procedures and management actions will achieve the desired results;
- timeous application of corrective measures when negative impacts arise;
- ensuring that the available resources are applied in the most effective manner; and
- revising the management actions according to the results of the monitoring and auditing programmes

PROJECT	REQUIRED ACTIONS	TARGET & RESPONSIBILITY
1. Conduct an environmental audit at the end of each phase of the construction programme.	2. The ECO is to undertake an audit after the removal of the berm has been completed. 3. ECO is to undertake an audit after the construction of a new berm has been completed. 4. The ECO is to undertake an audit after the breaching of the sand berm across the flood channel to the south of the orange Rive mouth has been successfully undertaken.	To be undertaken by ECO in association with the RE/Contractor and Applicant (and Provincial Authority Contact Person).
2. Implement Corrective measures	1. Revise the EMP in accordance with the findings of the environmental audit, if changes are necessary. 2. Set strategy for implementing any necessary corrective measures. 3. Set specific objectives for correction or modification of procedures.	To be facilitated by ECO as part of audits.
3. Assess the success of management programmes set for the removal of the existing berm and the construction of a new berm	1. Applicant (and Provincial Authority Contact Person) is to assess the success of implementation of the various management programmes.	To be facilitated by ECO as part of audits.

SECTION H: CONTINUAL IMPROVEMENT OF EMP

H.1 REQUIREMENTS FOR EFFECTIVE IMPLEMENTATION

H.1.1 The Commitment of the Management Entity

To ensure the successful management of the proposed rehabilitation of Farm Rem/625 within the Orange River Estuary, it is imperative that initially the Applicant (and Provincial Authority Contact Person) and Alexkor commit themselves to:

- (a) Implementing the environmental management policy that has been set for the project;
- (b) Improving the environmental management of their development activities by facilitating an audit at the end of each of the construction programmes, and committing themselves to the resultant recommendations; and
- (c) Maintaining their commitment and leadership throughout the Construction and future Rehabilitation phases.

H.1.2 Document Control

The EMP is a basic planning framework guiding the construction phases (i.e. pre-construction [planning and design], construction and post-construction phases) of the project. It is important for the EMP to be revised (improved), if need be, by documenting all actions and management results in a structured format, and especially in accordance with the results of the ECO audits. It will be important for the EMP and its supporting documents to be accessible to all the implementing and management members responsible for implementing its actions.

H.2 REQUIREMENTS FOR CONTINUAL IMPROVEMENT

The EMP should be a dynamic document, which depends on continual revision to maintain its relevance. It is therefore imperative for the EMP to be updated and revised in accordance with information and data that emerges from the monitoring processes (such as ECO checklists), and new management techniques and technology that may become available. The primary requirement for achieving continual improvement is scheduled reviewing (audits at the end of each of the development phases).

H.2.1 Management Review

To maintain continual revision, appropriateness and effectiveness of the EMP, and thereby enhance its performance, the ECO should, on behalf of the Applicant (and Provincial Authority Contact Person), formally review and evaluate the EMP at defined intervals (e.g. at the end of each development phase). The scope of the review should be comprehensive, though not all elements of the EMP need to be reviewed at once, and the review process may take place over a defined period of time. The reviews should include the following:

- review the results of the monitoring analysis undertaken during the ECO audits;
- review the extent to which the objectives and targets originally set in the EMP have been met;
- review the applicability of the EMP in relation to changing conditions, circumstances and information; and
- obtain and review any concerns raised by relevant I&APs and relevant authorities that may arise during the Construction Phase and appropriately deal with such concerns in an integrated way.

SECTION I: CONCLUSIONS

The EMP is a fundamental element of the management process that is aimed at ensuring the environmental sustainability of the proposed project to remove the existing berm that is blocking the proper functioning of the southern portion of the Orange River Estuary and the construction of a new earth berm to protect the low-lying areas of the northern, central sections of Alexander Bay, and especially the sports fields. In addition, the EMP is to be used for ensuring that the sand berm across the flood channel to the south of the Orange River mouth is successfully implemented, by connecting the flood channel to the tidal flow of the orange River.

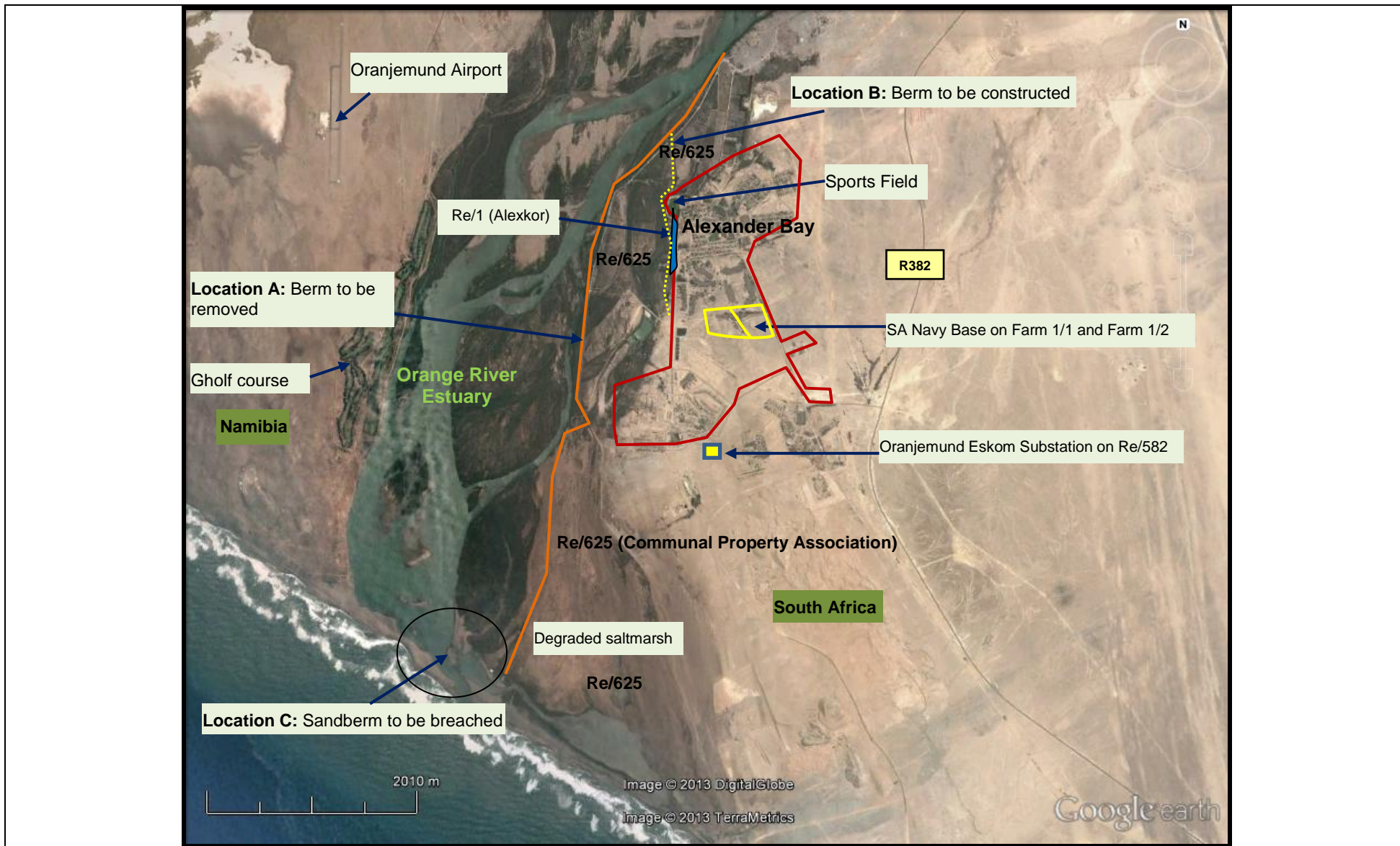
The implementation of the EMP will also ensure that the conditions of approval laid down by the various authorities will be met and that the recommendations of the BAR are carried out effectively. It is imperative for the EMP to be actively implemented and used at all management levels as an integral part of the project. The ECO should ensure that the recommendations of the EMPs are carried out.

The EMP should be revised in accordance with any comments flowing from the public participation process that is to be conducted in terms of the Basic Assessment process to be carried out in terms of the NMA Regulations 2010.

WITHERS ENVIRONMENTAL CONSULTANTS
November 2013

FIGURES

- Figure 1:** Google Image of the Site and Preferred Alternative on Location A, B and C, on Farm Rem/625, Orange River Estuary.
- Figure 2:** History of the degradation of the Orange River Mouth (Source: Bornman et al 2005.)
- Figure 3:** Design Alternative 1 – Proposed removal of the culverts placed in the berm on Farm Rem/625, Orange River Estuary.
- Figure 4:** Culverts were installed in the causeway approximately 700 m to the east of the first breach on Farm Rem/625, Orange River Estuary.
- Figure 5 and Table 1:** Google Earth map and Table indicating co-ordinates along the proposed route for the removal of the berm (Location A) on Farm Rem/625.
- Figure 6:** Google Earth map indicating the Proposed route for the construction of the berm (Location B) on Farm Rem/625, Alexander Bay.
- Figure 7:** Google Earth map indicating the Proposed artificially breaching of the sand berm across the flood channel to the south of the Orange River Mouth (Location C).



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FIGURE 1: FARM REM/625 AND SURROUNDING PROPERTIES
PROPOSED REMOVAL OF THE EARTH BERM WITHIN THE LITTORAL ACTIVE ZONE OF THE ORANGE RIVER ESTUARY, FARM REM / 625, ALEXANDER BAY, NORTHERN CAPE.



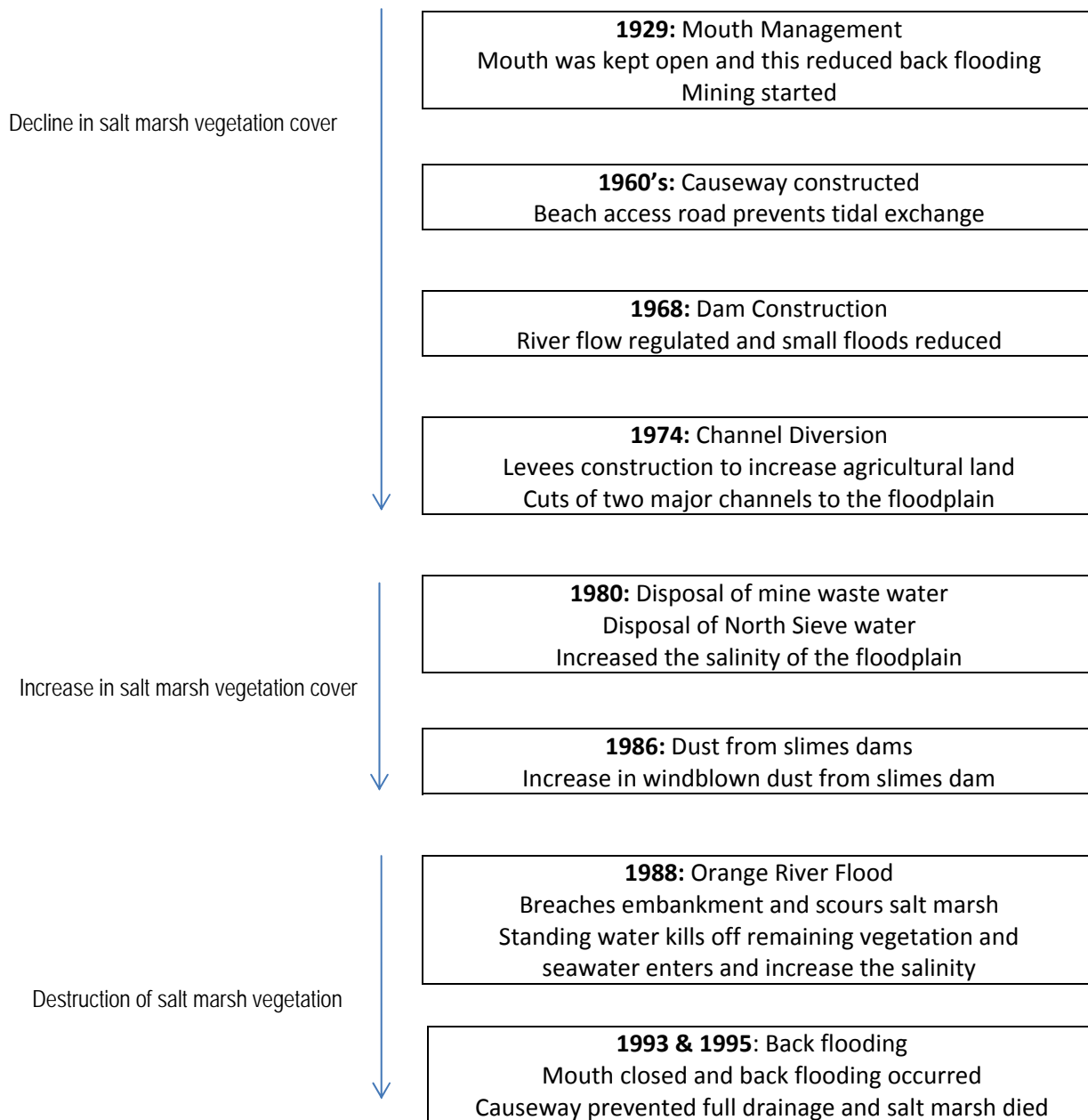


Figure 2: Possible sequence of events contributing to the loss of saltmarsh vegetation at the Orange River Mouth.

(Source: Bornman et al., 2005)



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FIGURE 3:
PROPOSED ALTERNATIVE DESIGN FOR REMOVAL OF EARTH
BERM AT “LOCATION A”, ORANGE RIVER ESTUARY, FARM
REM /625, ALEXANDER BAY, NORTHERN CAPE.



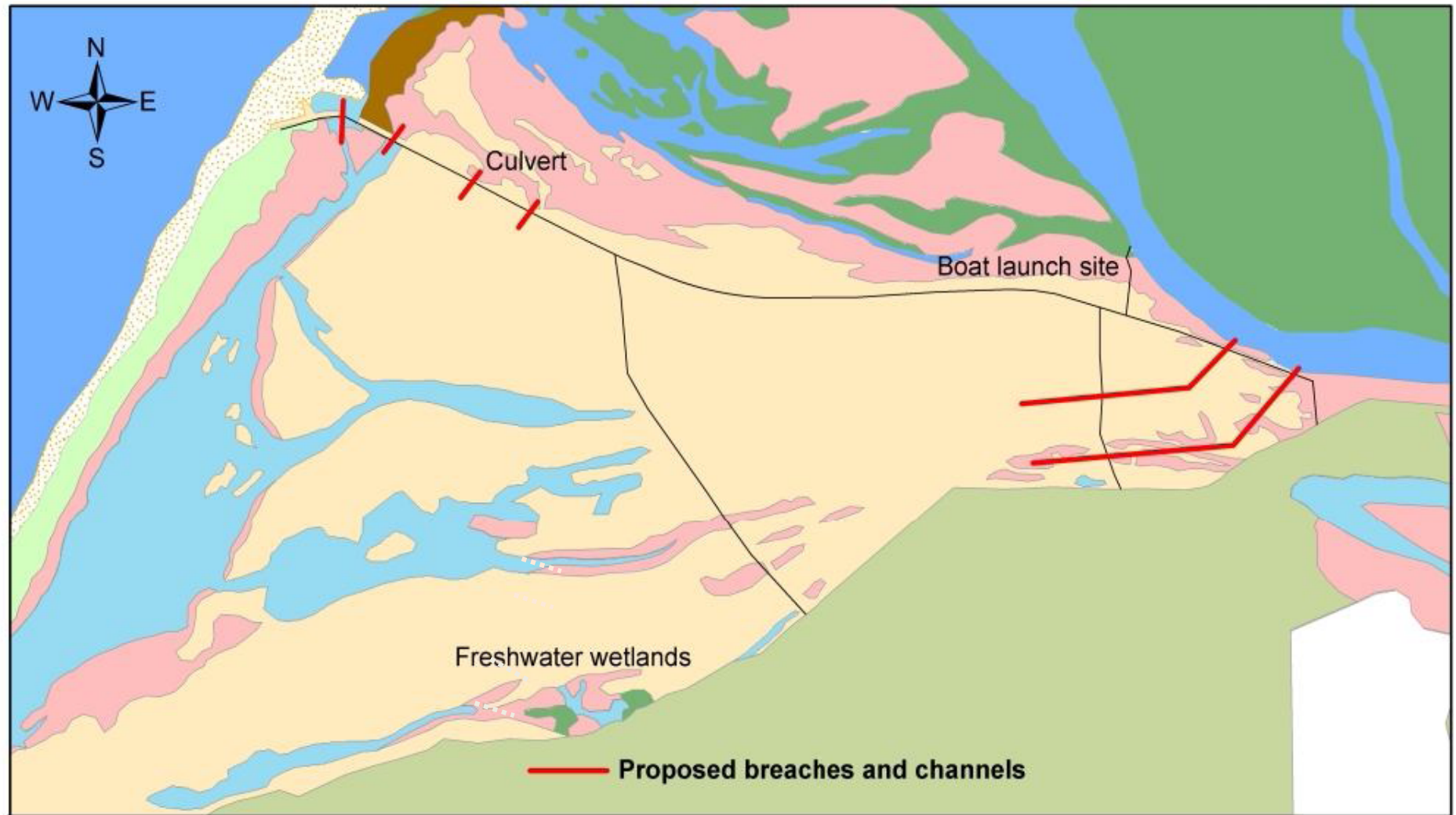


FIGURE 4
SUGGESTED LOCATIONS TO BREACH THE CAUSEWAY AND EXCAVATE CHANNELS
SOURCE: BORNMAN ET AL., 2005

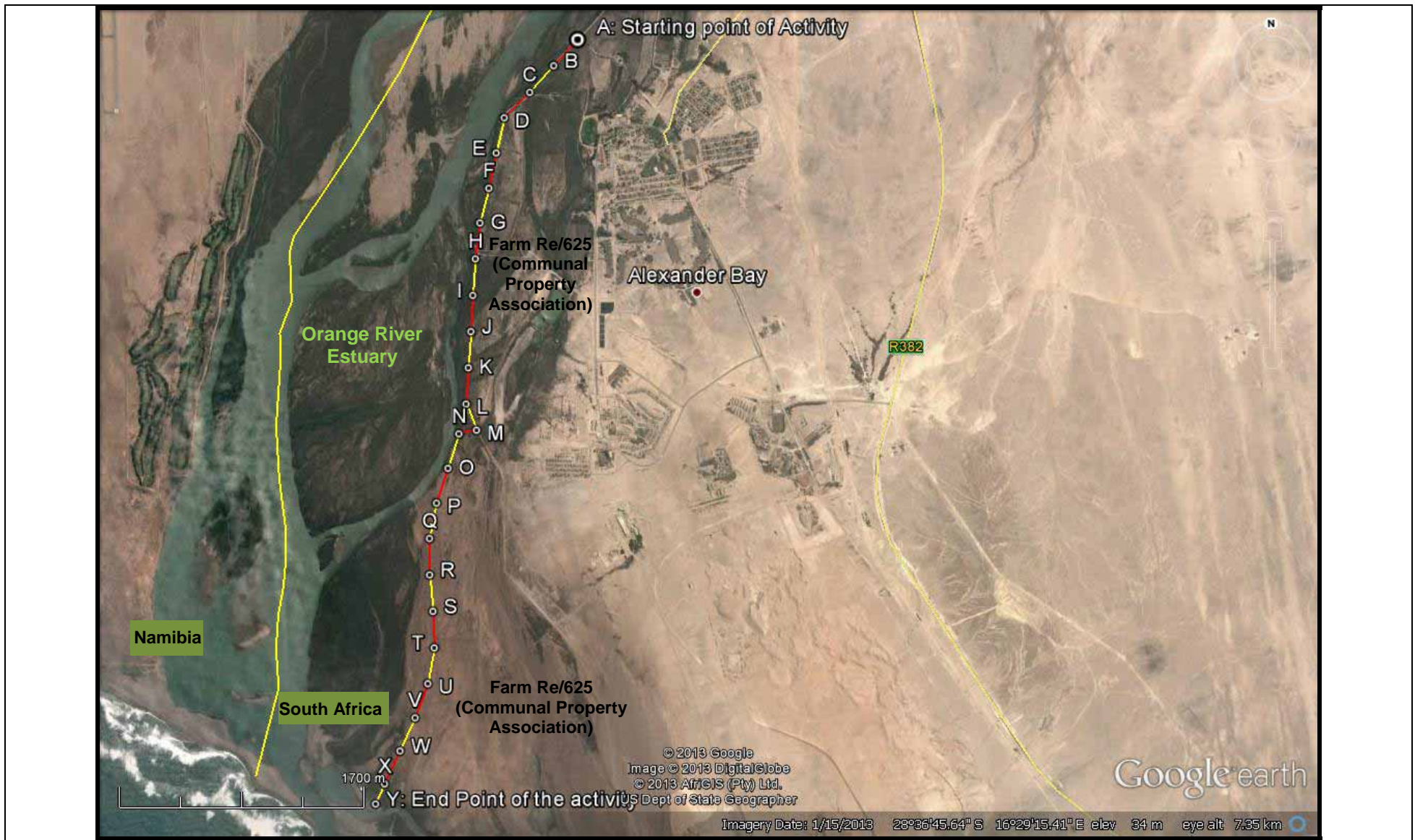


FIGURE 5
PROPOSED REMOVAL OF THE EARTH BERM AT “LOCATION A” ON
FARM REM/625, ORANGE RIVER ESTUARY, ALEXANDER BAY,
NORTHERN CAPE. REFER TO TABLE A FOR CO-ORDINATES.



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Location A: Proposed removal of the earth berm on Farm Re/625, within the littoral active zone of the Orange River Estuary.

Table A: Co-ordinates taken every 250 meters along the route of the berm.

Please note the distance between Point L and Point M is 195m and the distance between Point M and Point N is 125m.

Points on attached map	Latitude (S)	Longitude (E)
Point A : Starting point of activity	28°35'18.17"S	16°28'45.67"E
Point B	28°35'23.93"S	16°28'39.18"E
Point C	28°35'29.72"S	16°28'32.80"E
Point D	28°35'35.24"S	16°28'26.02"E
Point E	28°35'43.09"S	16°28'23.65"E
Point F	28°35'50.98"S	16°28'21.46"E
Point G	28°35'58.71"S	16°28'18.86"E
Point H	28°36'6.74"S	16°28'17.34"E
Point I	28°36'14.94"S	16°28'16.35"E
Point J	28°36'23.06"S	16°28'15.54"E
Point K	28°36'31.17"S	16°28'14.55"E
Point L	28°36'39.32"S	16°28'13.63"E
Point M : Middle point of the activity	28°36'45.29"S	16°28'16.07"E
Point N	28°36'45.97"S	16°28'11.51"E
Point O	28°36'53.63"S	16°28'8.41"E
Point P	28°37'1.36"S	16°28'5.16"E
Point Q	28°37'9.27"S	16°28'3.03"E
Point R	28°37'17.46"S	16°28'2.72"E
Point S	28°37'25.68"S	16°28'3.23"E
Point T	28°37'33.91"S	16°28'3.22"E
Point U	28°37'41.92"S	16°28'1.26"E
Point V	28°37'49.51"S	16°27'57.67"E
Point W	28°37'56.84"S	16°27'53.49"E
Point X	28°38'4.13"S	16°27'49.23"E
Point Y: End point of the activity	28°38'8.59"S	16°27'46.72"E



FIGURE 6
GOOGLE EARTH MAP INDICATING THE PROPOSED ROUTE FOR THE CONSTRUCTION OF THE BERM AT "LOCATION B" ON FARM REM/625, ALEXANDER BAY.



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SAND BERM
CO-ORDINATES:

28°37'57.59"S
16°27'30.58"E



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FIGURE 7
GOOGLE EARTH MAP INDICATING THE PROPOSED ARTIFICIALLY BREACHING OF THE SAND BERM ACROSS THE FLOOD CHANNEL TO THE SOUTH OF THE ORANGE RIVER MOUTH (LOCATION C).



APPENDIX 1

Construction Guidelines

APPENDIX 1

THE PROPOSED REMOVAL OF THE EARTH BERM WITHIN THE LITTORAL ACTIVE ZONE OF THE ORANGE RIVER ESTUARY, ALEXANDER BAY, NORTHERN CAPE CONSTRUCTION GUIDELINES

1. INTRODUCTION

Construction is potentially one of the most destructive phases of the development process that can harm the environment permanently if it is not appropriately planned and the necessary mitigation correctly applied and managed.

Construction implies certain inevitable levels of change to the affected environment or 'place'. A certain degree of change to the environment, within acceptable environmental norms, nevertheless has to be accepted. It is, however, important for such inevitable change to be limited within confined boundaries, so as to protect ecological, social, and cultural characteristics (i.e. the 'sense of place') of the affected environment, by pursuing the best practicable environmental option(s) or practices.

A primary environmental objective is, therefore, to limit the unavoidable disturbance or fragmentation of the environment to the *'limits of acceptable change'*.

The EMP, together with these Construction Guidelines, is to form part of the construction contractual documentation, i.e. the appointed contracts must be fully aware of the environmental management programmes that need to be carried out as part of the construction programmes.

The construction programme is to be implemented by the appointed contractors, on behalf of the Applicant, the Department of Environment and Nature Conservation, in accordance with the EMPs and these Construction Guidelines.

Compliance with the Construction Guidelines will be monitored by the ECO (Environmental Conservation Officer), to be appointed, who will also monitor compliance of the conditions of contract and conditions of approval (Environmental Authorisation).

This Construction Guideline document forms part of the Contractor's contractual documentation entered into between the Applicant and the Contractor and must be signed by the appointed Contractor as acknowledgement of its content.

2. PRE-CONSTRUCTION PHASE

This phase is to be based on the following principles and guidelines:

- A construction contract must be established between the Applicant and the appointed Contractor(s). The contract should include a penalty clause for both environmental and construction transgressions.
- The construction site office, stores, and temporary storage of diesel is to be located on an appropriate, non-environmentally sensitive site and must be accessible to large trucks

and be large enough for the secure storage of equipment, and mechanical machinery and the delivery of any raw materials that may be required.

- Construction personnel should not be housed on the site and will need to be transported to work on a daily basis. Only security personnel may stay on site to maintain a security presence, should this be necessary.
- The Contractor should provide the necessary training of staff to fill certain construction jobs on site. The Contractor should also be obliged to employ a Richtersveld Municipality first policy when employing staff.
- The ECO must inform all contractors and their personnel in respect of the environmental code of conduct prior to the commencement of any construction work.
- The ECO must point out the boundaries of the construction site to the contractor. Construction workers must remain in close proximity to the construction site and no machinery will be allowed on the sensitive salt marsh vegetation.
- If required only one refuelling area should be provided at the stores/site office. A bunded area must be provided beneath the storage tank. The bund must be watertight and must be able to contain 110% of the volume of all fuels and chemicals to be housed in it for the duration of the construction period. A concrete apron must be cast on the refuelling area to contain diesel spills and drips. The concrete floor of the bunded area can be lined with a layer of soil approximately 150mm thick to absorb any spills and drips. This soil layer is to be replenished from time to time according to the degree of contamination and the contaminated soil removed to an applicable waste disposal facility that accepts such toxic waste. If a mobile fuel bowser is to be used it must be checked for leaks and efficient operation and must have a drip tray under it when parked. All oils diesel and release oils used in the construction process must be kept within the bunded area. Access to the bunded area must be controlled at all times and must be locked at all times.
- The parking and service area for construction vehicles should be well-compacted earth or concrete to prevent oil and diesel spills contaminating the soils of the site. Such an area must be at least 100m from any wetland or saltmarsh community. Should oil or diesel spills occur, they should be treated with a suitable hydrocarbon absorption or remediation product. Absorbent spill mop-up products need to be on hand - Products to be investigated should include sunsorb absorbents (tel. 021 674 7277 www.sunsorb.com) and the hydrocarbon encapsulator "Oilcap" (www.gh2o.co.za).
- A suitable leak proof container for the storage of oiled equipment (filters, drip tray contents and oil changes etc.) must be provided if servicing of vehicles takes place at stores/site office. Fuels and oils must be safely located out of harms way from the elements (preferably within the bunded area) and safety and fire prevention must be strictly adhered to. The necessary fire hydrants should be on site.
- Alien vegetation must be cleared according to the directives contained in the EMP and in the Recommendations for Clearing of Alien Vegetation (**Appendix 2** of the EMP).
- Felled alien plant material must be removed from the property by appropriate means to reduce fire risk.
- It may be necessary for the Contractor to stabilise the exposed sandy areas to prevent erosion and dust by wetting the exposed surfaces with freshwater or erecting shade cloth netting. The access roads may also require wetting to suppress dust.

- The Contractor must provide temporary chemical toilet facilities at the stores/site office area. A minimum of **one toilet shall be provided per 15 persons at each working area** or as stipulated by the local authority. The toilets must be kept in a clean and sanitary condition, and must be regularly serviced. Toilet paper is to be provided by the Contractor.

3. CONSTRUCTION PHASE

This phase is to be undertaken in accordance with the following principles and guidelines:

The construction area must be clearly demarcated and no construction activity will be allowed outside of this area.

- Construction vehicles must not be allowed to leave the demarcated areas and should only use the existing access road/s in and out of the construction area.
- All vehicles, equipment, fuel and petroleum services and tanks must be maintained in a good condition that prevents leakage and possible contamination of soil or ground water supplies.
- All emergency servicing of vehicles must be conducted over a drip tray present to prevent accidental spillage of oils and fuels. Used oil should be recycled or disposed of at a hazardous waste disposal facility.
- All fuel/ oil spills must be reported to the ECO.
- Construction material must be stored in areas designated by the Site Agent and in a neat and orderly manner.
- The Contractor must store any excavated material stockpile in a suitable area designated by the ECO for removal as soon as possible.
- All other solid waste must be kept in appropriate containers and must be removed from the site by the Contractor on a weekly basis to a licensed waste disposal facility. **The burning of solid waste and paper will not be allowed on site.** Recyclable waste should be recycled if at all possible (metal, paper, cardboard, bottles, tins and plastic).
- Concrete mixing and the subsequent cement residues must be restricted to a designated area on the site. Such residues are to be removed from the site within one week of completing each phase of the construction period.
- **Used cement bags are to be stored in a wind and rainproof container for disposal.** Used bags may not lie around on site nor may they be burnt on site.
- Excess or spilled concrete should be confined within the works area and then removed to a waste site.
- Cement powder has a high alkalinity pH rating that can contaminate and affect both soil and water pH dramatically. Cement spills must therefore be prevented or cleared as soon after the spill as possible.
- Any open excavations must be protected with danger tape.

- Disturbed areas around the building sites, where dust can arise, should be kept moist by spraying with water from a water bowser or other suitable means.
- The Contractor will be responsible for security on the site of works and will ensure that his staff do not trespass onto other properties.
- The Contractor must provide dedicated eating areas for staff. Waste bins with lids must be provided at such areas. Such eating areas are to be maintained in a neat condition.
- Open fires (if allowed by the Safety Officer) must be contained in a dedicated area and within a suitable container. Any fires must be supervised at all times. Treated timber and waste from the construction site must not be burnt on site.
- The ECO/RE must monitor the contractors' compliance with the construction and progress in terms of the above environmental guidelines on a regular basis. The ECO will issue an ECO Checklist within 5 days after each site visit to provide a record of instructions given to the Contractor/Site Agent for environmental work that needs to be done or where problems have been noted.

4. POST-CONSTRUCTION PHASE

This phase is to be undertaken in accordance with the following principles and guidelines:

- The Contractor must remove all oil spills as soon as possible. Alternatively spills may be picked up and stored in appropriate containers/waste skips prior to removal.
- All forms of waste must be removed from the site, within one week after completing a particular phase.
- The rehabilitation of disturbed areas can commence as soon as disturbed areas become available and once climatic conditions allow for it. For example by erecting shade cloth fencing to prevent wind erosion and dust. .
- The ECO must make sure that all the environmental stipulations put forward in the construction contracts and/or ECO Checklists have been complied with, and must advise the Applicant/RE if the penalty clause needs to be applied for any environmental impacts that may have occurred.
- All temporary structures used for the construction phase are to be removed from the site within three weeks after completion of the successful removal of the berm and the construction of the protection berm around the sports fields and low-lying sections of Alexander Bay.
- The Contractor must remove any remaining materials within one week after completion of the project, to an appropriate licensed dumping site.
- No remaining berm material must be on the site, and all areas where the berm once stood must be scarified and left in a neat and clean state.
- The Contractor must repair disturbed areas (e.g. deep tracks left by construction vehicles) within one week after completing the project.
- The ECO is to undertake an environmental audit of the project within the first week after the contract has been completed to ensure that all the contractual obligations have been

completed. The final site inspection will take place with the contractor, RE, DE&NC and Alexkor. Any follow-up rectification work must be immediately carried out.

The Contractor must accept the above Construction Guidelines. **It is expected that the Contractor sign this document as part of the main contract with the Applicant.** The main Contractor will also be solely responsible for the conduct of all subcontractors that may be used in this contract.

Signed by: _____ on behalf of: _____

Name: _____

Signed by: _____ on behalf of: _____

Name: _____

Witness: _____

Name: _____

Date: _____

APPENDIX 2

Alien Vegetation Management Guidelines

APPENDIX 2

RECOMMENDATIONS FOR CLEARING OF ALIEN VEGETATION

Compiled by: Charl Cilliers

Updated: July 2013

1. INTRODUCTION

While this document focuses on recommendations for effective clearing of *A. saligna* the general management principles should be applied equally to other invasive alien species (should they be encountered in undesirable locations) to:

- a) avoid any un-intentional negative environmental impacts resulting from the clearing operation and
- b) optimise results in terms of economy and practicality.

The chemicals and herbicides suggested in this document are available locally, from Ecoguard Distributors (Pty) Ltd. (tel. 021-8628457) and have been chosen because a) they are effective and b) they have low or negligible short or long-term environmental toxicity. Unless stated herbicide/dye mixing concentrations and application rates for the different species are available from the suppliers. Importantly, Material Safety Data Sheets (MSDSs) for all chemicals and herbicides used must be available on site at all times. These documents contain vital information pertaining to environmental toxicity, health and safety regulations, flammability, storage instructions, procedures to follow in case of accidental ingestion and disposal methods. Some, but not all of these MSDSs can be downloaded from the site <http://www.ecoguard.co.za>

It is important to remember that this document should serve as a basic guide only. For more information contact the Plant Protection Research Institute tel. 033 355 9415/16 or the Department of Water Affairs and Forestry's toll free information line tel. 0800 005 376 or refer to the book ALIEN WEEDS AND INVASIVE PLANTS by Lesley Henderson (2001). This book also contains the complete set of regulations concerning declared weeds and invaders (divided into categories) as specified by the Conservation of Agricultural Resources Act, 1983 (Act No.43 of 1983) and the amendments published in the Government Gazette of 30 March 2001.

The categories of declared weeds (regulation 15) and invader plants contained in Lesley Henderson's book may be used to prioritise which species to tackle first.

2.1 Australian Acacias

Adaptations to fire and competition with native flora.

Australian acacias produce enormous amounts of viable seed in the absence of natural seed predators (Jones 1963, Milton 1980, Jeffery *et al.* 1988, Cronk and Fuller 1995, Pieterse and Boucher 1997, Cilliers *et al.* 2004). These seed banks build up in the soil, do not lose much viability over time and germinate profusely following fires, which break their dormancy (Boucher 1978, Milton 1980, Milton and Hall 1981, Pieterse 1986, Pieterse and Cairns 1986, Holmes 1988). Milton and Hall (1981) state that: *“the large seed bank is a major obstacle to the removal of Australian acacias from the indigenous vegetation of the Cape.”*

It is also well known that these aggressive plants are capable of rapid growth. Roux and Middlemiss (1963) state that *“no indigenous tree or bush species exhibits such rapid or sustained growth as the invaders, and no indigenous tree growing in the same habitat can overtop them.”*

The result of these adaptations is that, if left un-checked, these species quickly dominate the landscape. They reduce bio-diversity, utilise more water than indigenous vegetation and increase both the fire risk and damage caused by fire where they occur in dense stands.

Control of mature acacias

Although foliar herbicide applications may kill mature trees it is not an economically viable or indeed practical option and trees may produce even more seeds when stressed/dying (Dr. Charlie Boucher pers. comm. 2002, Dean Ferreira pers. comm. 2006).

Mature **black wattle** (*A. mearnsii*) and **port jackson** (*A. saligna*) plants should therefore be manually clear-cut and the stumps painted with a registered biodegradable herbicide to kill them and in so doing, prevent coppicing. A dye (e.g. EcoBlue) should also be mixed with the herbicide prior to application so that the treated stumps are clearly marked. The recommended herbicide application involves 20ml Confront for *A.mearnsii* (25ml for *A.saligna*) used in conjunction with 5ml Actipron Super (a wetting agent) and 1ml EcoBlue per litre of water. Note that Withers Environmental Consultants prefer not to advocate the alternative use of diesel as a wetting agent due to the potential for environmental contamination.

According to Boucher and Stirton (1978) "*A. longifolia* (**long-leaved wattle**) does not coppice and *A. cyclops* (**rooikrans**) rarely does so, so while herbicide treatment on the cut stumps is unnecessary, plants should be cut as near as possible to ground level". The herbicide suppliers do however suggest cut stump applications of 30ml Timbrel + 5ml Actipron + 1ml EcoBlue per litre of water for these species.

Mature **blackwood** *A. melanoxydon* trees should be manually felled and the cut stumps painted with 40ml Confront + 5ml Actipron + 1ml EcoBlue per litre of water or 60ml Timbrel + 5ml Actipron + 1ml EcoBlue per litre of 1Lt Water. Blackwood trees coppice strongly and are notoriously difficult to kill, therefore care must be taken that all the lower branches are removed and that the cut surface is well covered with herbicide.

In recently burnt stands of mature plants, follow-up treatment must occur within a few months (especially in wet areas), before the mass of regenerating seedlings have a chance to grow, mature, flower and produce more seed.

Control of acacia seedlings

Very dense stands of acacia seedlings may be sprayed with a foliar herbicidal spray mixed with a wetting agent. Alien saplings should be less than 1.5 m tall for the foliar application to be most effective (plants become more difficult to kill as they grow). Foliar sprays should be conducted on wind free days to avoid contamination of non-target native plants, wasting of the herbicide, drift and possible health hazards. Importantly, spraying should only be conducted when the air is cool. This is due to the fact that leaf stomata close above 22°C resulting in ineffectual herbicide absorption (Willie Meyer pers. comm.).

Appropriate eradication treatment needs to be re-applied where necessary and the area inspected for survivors on a bi-annual basis since some species grow to flowering in one year under optimal conditions (Dr. Charlie Boucher pers. comm. 2006). Regular inspection and follow up work is especially important since remaining un-germinated soil borne seeds will most likely be stimulated to germinate by environmental cues following the foliar herbicide application and death of the first swathe of seedlings (Dean Ferreira pers. comm. 2006).

Individual or sparsely distributed small (< 30 cm tall) acacias can be pulled by hand or by using a puller/popper tool (when plants are between 30 cm and ± 50 cm tall (NB this does not apply to Blackwood or Port Jackson seedlings). Saplings (>30 cm tall, all species) may alternatively be cut using a lopper (long-handled secateur-like instrument) or brush-cutter and the stumps painted with herbicide in the case of coppicing species (Anonymous 2000).

Confront herbicide may be sprayed on regenerating acacia seedlings on the banks of streams, rivulets, drainage lines and water bodies if correctly and carefully administered on wind-free days. Herbicide should not however be used directly over surface water (including runoff following heavy downpours) to avoid the chance (albeit small) of environmental contamination. The chemicals that make up Confront, viz. Triclopyr and Clopyralid both have low environmental toxicity (even in high, undiluted doses) and are biodegradable. The wetting agent, Actipron Super is also by nature biodegradable.

Port jackson *A. saligna* seedlings: Hand-pull (only when soil is damp) and infestations are light. Seedlings have a very long taproot, which makes them difficult to pull out. To make matters worse the root often than not breaks off at ground level and re-sprouts (coppices). Foliar herbicide is therefore the recommended method, especially in the case of dense stands (0.7% Confront used in conjunction with 0.5% Actipron).

A. cyclops (**rooikrans**) and *A. longifolia* (**long-leaved wattle**) seedlings (which germinate en masse after fire or soil disturbance) can be hand-pulled (sparse infestations) or sprayed with 0.7% Confront used in conjunction with 0.5% Actipron (dense infestations). This approach must be repeated annually in order for successful eradication.

Blackwood *A. melanoxylon* seedlings: Blackwood control should be viewed as a long-term strategy, since they are particularly hardy and because of their large soil-stored seed-banks. It is a difficult species to control by mechanical means alone, as it coppices when cut and regenerates vigorously from root suckers. Hand pulling of these seedlings is not recommended; as they have deep taproots that tend to break off. Therefore apply a foliar herbicidal spray of 0.7 % Confront used in conjunction with 0.5% Actipron. Repeated spraying is necessary during the same growing season due to the tenacity of the seedlings. If cut blackwood stumps coppice re-cut the new growth and treat the cut stumps with a stronger herbicide (with dye) solution: 4% Confront used in conjunction with 0.5% Actipron.

Black wattle *A. mearnsii* seedlings: Hand-pull when soil is damp and seedlings are sparsely distributed, but use a foliar spray when seedlings are dense ([Internet 1](#)). Seedlings and juvenile plants are sensitive to foliar applications of triclopyr (0.5% Confront used in conjunction with 0.5% Actipron). When sawn black wattle *A. mearnsii* stumps coppice re-cut the new growth and treat the stumps with a stronger herbicide (with EcoBlue dye) solution: 2% Confront used in conjunction with 0.5% Actipron.

2.2 *Eucalyptus* Trees (Gums)

Reasons for their removal

Eucalyptus trees are transformers of natural habitats, exceptionally fast growers and huge users of water. Although not all the species listed below are problem plants in the Northern Cape even scattered individuals should be removed where they occur due to their innate ability for huge seed production and potential for rapid spread.

Control of mature gum trees

Mature trees need to be felled by chain saw. Only experienced operators may use chain saws and full PPE (Personal Protective Equipment) must be worn at all times (including ear protection). NB gum tree stumps require different concentrations of herbicide according to the species.

Red river gum *Eucalyptus camaldulensis* stumps may be treated using 60ml Timbrel + 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Sugar gum *E. cladocalyx* stumps may be treated using 125ml Timbrel + 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Karri *E. diversicolor* stumps may be treated using 30ml Timbrel + 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Blue gum *E. grandis* stumps may be treated using 35ml Confront + 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Spider gum *E. lehmanni* stumps necessitate 60ml Confront + 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Black iron bark trees *E.sideroxylon* are tougher still and require 125ml Confront+ 5ml Actipron Super + 1ml EcoBlue per 1 litre of water.

Where mechanically cleared (by chain-saw) mature gum trees have coppiced we suggest two alternatives for control:

- a) The coppiced stems can be re-cut and re-painted with herbicide (e.g. Timbrel or Confront) mixed with a dye (e.g. EcoBlue).

- b) A mixture of 10 grams Brush-off per 100 ml Mamba added per 15 litres of water may be sprayed on to the coppice growth (this method is less labour intensive and has been applied successfully at the Berg River Dam).

Control of gum tree seedlings

Seedlings may be hand-pulled if small enough (and care is taken that the entire root system is removed).

Alternatively, in the case of dense infestations over large areas seedlings may be sprayed using the following same herbicide/ wetting agent mixtures:

Red river gum *Eucalyptus camaldulensis* 8ml Garlon + 15ml Mamba per 1 litre of water.

Sugar gum *E. cladocalyx* 15 litres of water + 10 grams Brush-Off + 100ml Mamba.

Karri gum *E. diversicolor* 8ml Garlon + 15ml Mamba per 1 litre of water.

Blue gum *E. grandis* 8ml Garlon + 5ml Actipron per 1 litre of water.

Spider gum *E. lehmanni* 8ml Garlon + 15ml Mamba per 1 litre of water.

For **black iron bark** seedlings (*E. sideroxylon*) contact the herbicide suppliers at 021 862 8457 for advice.

2.4 Pine Trees (*Pinus pinaster* and other *Pinus spp.*)

Adaptations to fire and competition with native flora

P. pinaster does not have the capacity to re-sprout after fires when stands are killed, but seedling regeneration following fires is prolific aiding in the spread of this alien (Kruger 1977, Boucher 1984).

Its faster growth rate and longer lifespan compared with the native flora, along with a short primary growth period, aids in its invasibility (Kruger 1977, Cronk and Fuller 1995). Trees bear seed from about their sixth year (Boucher 1984).

Control of mature pine trees

Mature stands of *P. pinaster* are best felled by chain saw, manual saw or axe since the species is resistant to chemical control (Martens 1997).

Neser and Fugler (1980) state that: “*By systematically cutting or removing isolated plants that are scattered in natural vegetation the development of severe, dense infestations which may be difficult and costly to control, can be prevented relatively easily*”. This principle applies equally to hakeas, pines and other invasive alien plant species.

Control of pine seedlings

Follow up weeding should be done within one year after clearing or fire and thereafter survivors need to be cleared every year after that. It often occurs that a stand of pines (and/or hakeas) is replaced by acacias after clearing or burning (Cilliers 2002). This is due in part to these stands having been used as roosting areas for frugivorous birds - which spread acacia seeds.

Pine seedlings should be hand-pulled. A “popper” tool may be used for weeding small numbers of juvenile pines in sandy areas if they have grown too large to be pulled by hand, alternatively a lopper (long-handled secateur-like instrument) or brush cutter may be used (Cilliers 2002).

In contrast to Martens (1997) the distributors (Ecoguard) recommend a foliar herbicide application of 10ml Garlon + 5ml Actipron per litre of water for seedling control.

2.2 Other Species

Bugweed *Solanum mauritianum*, may be effectively controlled with foliar herbicide applications of 6ml Confront used in conjunction with 5ml Actipron per litre of water, provided the plants do not exceed 1.5 m in height. Otherwise the plants should be felled and a mixture of 30ml Timbrel + 5ml Actipron + 1ml EcoBlue per litre of water applied to the cut stumps.

Bramble *Rubus cuneifolius* may be effectively controlled with foliar herbicide applications of 7ml Confront used in conjunction with 5ml Actipron per litre of water.

Scotch Thistle *Cirsium vulgare* is tougher and requires a much larger dose. It may be controlled with foliar herbicide applications of 75ml Confront used in conjunction with 5ml Actipron per litre of water,

Stinkbean *Paraserianthes lophantha* may be effectively controlled with a weak foliar herbicide application of 3ml Confront used in conjunction with 5ml Actipron per litre of water, provided the plants do not exceed 1.5 m in height. If the mixture is too strong the soft eaves quickly wilt before the poison has a chance to get to the roots. Although Stinkbean does not readily coppice the herbicide suppliers recommend the following procedure. If the plants are larger than 1.5m they should be felled and a mixture of 30ml Timbrel + 5ml Actipron + 1ml EcoBlue per litre of water applied to the cut stumps.

Spanish reed *Arundo donax*. Control of large tracts of this species usually involves burning followed by repeated applications of herbicide onto the emergent shoots. The nature of the infestation on erf 10496 does **not** however lend itself to burning. The patches of *Arundo* should be mechanically felled as close to the ground as possible and the new shoots repeatedly sprayed (every two weeks or so) with a 50ml of Mamba per litre of water mixture.

Mature hybrid **grey poplar** *Populus canescens* trees should be manually felled and the cut stumps painted with 1Lt Water + 60ml Timbrel + 5ml Actipron + 1ml EcoBlue. Seedlings and plants less than 1.5m tall can be foliar sprayed with a mixture of 1Lt Water + 15ml Garlon + 5ml Actipron.

English oaks *Quercus robur* should be manually felled as close to the ground as possible and the cut stumps painted with 60ml Timbrel + 5ml Actipron + 1ml EcoBlue per litre of water.

Sesbania *Sesbania punicea* seedlings should be sprayed with 5ml Garlon mixed with 5ml EcoBlue per 1 litre of water. Although Sesbania does not readily coppice the herbicide suppliers recommend the following procedure. If the plants are larger than 1.5m they should be felled and a mixture of 10ml Garlon + 5ml Actipron + 1ml EcoBlue per litre of water applied to the cut stumps.

Sesbania and Stinkbean slash should be stacked in piles so that the seeds can be concentrated in one spot, thus facilitating easy follow-up work.

Hakeas *Hakea* sp. Once the tree has been cut down, below the lowest leafy part of the stem, the fruits, which contain seeds, open up naturally, dispersing the seeds over a wide area. This opening up process is greatly accelerated by fire. So on no account burn hakea that has been felled and stacked before the fruits have released all of their seeds. The recommended method is, after cutting down the tree, to remove the branches using a secateur or saw and make a series of small stacks, 40cm high and place rocks on top of each stack to anchor it. When the fruit drops off naturally in the stacks and open up most of the seeds will be eaten by field mice and regeneration will be minimal. Annual return visits will be necessary to remove any regenerating seedlings by hand.

Mature **syringa** *Melia azedarach* trees must be cut as close to the ground as possible. The stumps may then be treated with 30ml Confront + 5ml Actipron + 1ml EcoBlue per 1 litre of water. Syringa seedlings may be effectively controlled with foliar herbicide applications of 75ml Confront used in conjunction with 5ml Actipron per litre of water, provided the plants do not exceed 1.5 m in height.

Beefwood trees *Casuarina cunninghamiana* and *C. equisetifolia* are not sensitive to foliar herbicide applications. Seedlings and mature plants have to be manually removed. The seedlings are however often well-rooted and difficult to remove with their roots. Ecoguard recommends a cut stump treatment of 20ml Garlon + 5ml Actipron + 1ml EcoBlue per litre of water.

Broad-leaved herbaceous weeds may be effectively controlled with a weak foliar herbicide application of a general herbicide e.g. 3ml Confront used in conjunction with 5ml Actipron per litre of water. We also recommend adding 1ml EcoBlue to the mixture. Addition of dye makes it easy to see where one has already sprayed. Mamba and Round-up are also effective. These herbicides are however non-selective and will also affect grasses. In certain situations a selective herbicide such as Turfweeder (5-7 litres per hectare) may be a better option. Ecoguard can be contacted directly for advice.

Alien grasses: Recent research has shown that burning is not an effective means of control as this stimulates grass re-growth. Hand clearing is also not recommended as this disturbs the soil, which promotes alien grass growth. Applying a pre-emergent, systemic herbicide has been found to be the most effective control method. Low concentrations (1.5 - 3%) of a glyphosate based herbicide such as Mamba can be used for controlling most alien grasses.

Overstrand municipality has a high success rate with a product called Focus Ultra on kikuyu (available from Henchem www.henchem.co.za in Stikland). Ecoguard can be contacted directly for additional advice.

3. METHODS AND CONSIDERATIONS NEEDED FOR EFFECTIVE SEEDLING CONTROL (Internet 1)

3.1 Hand-pulling

Gloves are needed. Seedlings need to be gripped by the stem as close to the ground as possible and pulled out in one smooth motion - taking care to remove the entire root system. Seedlings should be stacked on brush piles or rows along contour lines, to facilitate easy follow-up.

3.2 Foliar spraying

All herbicides must be mixed on a drip/ground sheet when working in the veldt in a demarcated area, out of direct sunlight and well away from surface water. The workers should under no circumstances rinse herbicide equipment in the veldt. They should as a matter of necessity observe the instructions for the safe use, mixture and application of the herbicide.

The workers should use knapsack sprayers fitted with cone nozzles (e.g. Spraying-Systems TG-2 or equivalent type) and wear the appropriate safety clothing at all times (protective gloves, rain suit and face-shield or safety glasses). This nozzle-type (larger droplet size than the Systems TG-1 nozzle) used in conjunction with a pressure of 100 kPa helps minimize drift onto surface water or non-target plants. The herbicide should be applied over the top of the seedlings, holding the nozzle about 50 cm above the plants and moving along straight lines, but making sure that all the leaves are covered.

Herbicides are also generally most effective when plants are actively growing. This implies that they will be more effective if applied on sunny days or during warm weather conditions (but below 22°C).

Herbicides must also not be sprayed if there is wind or evidence of drift, if plants are over 1.5 m tall, during rain or on wet, damp leaves. General safety precautions should always be adhered to viz. not allowing pregnant women to be directly involved in herbicide operations and never spraying near children, animals or directly over surface water.

Herbicide spraying should only be considered when the density of alien seedlings is high, otherwise hand pulling or other mechanical methods remains the preferred alternative.

4. MECHANICAL FELLING OF MATURE PLANTS – General principles

Mechanical felling applies to all species, and most situations for the initial clearing operation and includes the options of physical felling or uprooting of plants and their removal from the site or stacking (often in combination with burning, see section 6). Coppicing species however require chemical treatment immediately after cutting.

All plants should however be cut as close to the ground as possible since even small branches left on pines and acacias can continue to grow. Another advantage of cutting low is that this increases the size of the stump area - which results in improved herbicide intake.

While contractors usually select and provide their own equipment the following suggestions should be kept in mind. Hand-tools such as slashers and bowsaws can be used where stems do not exceed 50mm diameter. Slashers should however not be used for coppicing species as they do not produce a flat, clean surface for effective herbicide application.

With larger plants moderately sized chainsaws in the 2.5kW range become necessary. Note that only experienced operators may use chain saws and that full PPE (Personal Protective Equipment) must be worn at all times (including ear protection). Chain saws can be twice as cost-efficient as hand-tools if plants exceed 50mm stem diameter. In the case of dense infestations of tall, slender (50-80mm diameter) plants, brush-cutters in the 2.5 to 3 kW class should be used.

Note that if the user opts to conduct the manual clearing operation him/herself (and not employ specialist contractors) then it is imperative that all workers attend a chain saw / brush-cutter course (usually provided by the suppliers). Remember that all re-fuelling should be done over drip-trays (to prevent spills). Fuel should be properly stored on bunded concrete slabs or in drip-trays.

5. WOOD CHIPPING – General principles

One method of reducing the fuel load after clear felling is to feed alien slash through a mobile mechanical chipper. Chips can be caught in a trailer and dumped on site in an area where construction will not take place. These chips can be used later in the rehabilitation programme or to stabilise loose sandy areas.

Importantly *Eucalyptus* chips should not be used for rehabilitation work since gum wood (especially the bark) contains chemical compounds that inhibit the growth of other species when released into the soil (allelopathy). Branches containing seeds should also not be fed through the chipper as these seeds will as a matter of course get back into the soil and will germinate.

Larger, un-chippable stems and branches can either be sold for firewood or donated to local communities for that purpose.

6. FIRE

Fire has in the past been used as an effective tool for alien plant management in conjunction with mechanical clearing, for example in the burning of piles of felled alien slash or block-burning previously cleared areas where alien seedlings/saplings have germinated.

The use of fire is a high-risk activity and Withers Environmental Consultants suggests making use of experienced service providers for a) controlled block-burning operations (Dean Ferreira of The

Nature Conservation Corporation may be contacted at 021 7022884 or dean@natureconservation.co.za) or for b) alien clearing operations involving burning of large volumes of slash (Manfred Paulsen of the Working For Water Programme can be contacted at tel. 021 8762062 or alternatively Shaughn Frost of Fastfell can be contacted at tel. 082 338 8951).

Various factors need to be taken into account if burning is to be considered as a management option. A full risk assessment should be undertaken and a fire management plan (which includes the lay-out of fire breaks and agreements with neighbours etc.) must be drafted. Burning should only be allowed in late autumn (open fires are only allowed in certain months of the year as per Government Gazette). Burning is also only allowed under certain weather conditions on the day (blue or green Fire Danger Index). The Fire Danger Index is updated daily and is available at <http://www.weather-sa.co.za> for most major centres in the Northern Cape. The relevant authorities (Department of Environment and Nature Conservation, local municipality (Richtersveld), local fire department and DWA) and neighbouring landowners must be informed in writing of any planned burning operations. If, for any reason burning is to be done outside of the allowed dates as per Government Gazette a burning permit must be obtained from the Department of Water Affairs and Forestry.

7. BIOLOGICAL CONTROL

Various biological control agents have been brought in to South Africa as a management practice to control the spread of alien plants. Biological control involves the introduction of host specific pathogens and insects onto a plant in order to either kill it or reduce its reproductive output. This method forms part of integrated regional-wide governmental alien eradication programmes and, while probably not directly applicable to the property, is presented here for the sake of completeness.

The following paragraphs describe examples of biological control currently employed in the Western Cape.

The infection of *Acacia saligna* by the biological agent *Uromycladium tepperianum* involves the formation of galls (heavily infected plants may bear several hundred).

Acacia longifolia plants are also often characterised by galls formed by the wasp *Trichilogaster acaciaelongifoliae* while it's seeds are eaten by the recently introduced weevil *Melanterius ventralis*.

However, due to the unforeseen fact that plants sometimes inadvertently produce more seeds while stressed/dying specialists (for example the Agricultural Research Council/Plant Protection Research Institute tel. 021 887 4690) are used to advise on and supply bio-control agents.

8. CONCLUSIONS and CLOSING RECOMMENDATIONS

It has been well documented by many authors that the single most important aspect governing the success of alien plant control is follow-up work (Fenn 1979, Milton and Hall 1981, Ashton 1985, Pennington 1986, Phillips 1986, Pieterse and Boucher 1987, Macdonald *et al.* 1989, Martens 1994).

Follow-up clearing should thus commence as soon as possible after initial clearing due to the fact that if left unattended, the seedlings could grow to form impenetrable thickets which will be much more costly and difficult to eradicate. If however follow-up clearing remains a priority then alien plants will be effectively controlled.

Alien clearing should not however be seen as a “stand-alone” operation (especially where vegetation is cleared along riverbanks and/or drainage lines). Rehabilitation (seeding and planting) of locally indigenous flora is a must to ensure stabilisation of soil and in so doing to prevent large-scale erosion of denuded surfaces.

Keep in mind however that, if not well informed, rehabilitation by means of re-planting can do more harm than good, if incorrect species choices are made. Specialist advice is therefore recommended, as restoration can be a costly exercise. Deon van Eeden of Vula Environmental Services deon@vula.biz 082 564 5748 may be contacted for undertaking any rehabilitation of exposed surfaces.

9. LAWS CREATING A LEGAL DUTY ON LANDUSERS TO CONTROL INVADING ALIEN PLANTS.

Introduction

1. The adverse impacts of invading alien plants have been well-documented and scientifically verified.
2. Landowners are under a legal obligation to control invading alien plants occurring on their properties. This obligation exists as a result of the various laws. The relevant laws identified at this stage are the following:
 - i. The common law relating to neighbours and nuisance;
 - ii. Section 151(1) of the National Water Act 36 of 1998
 - iii. Section 28 of the National Environmental Management Act, 107 of 1998;
 - iv. Section 31A of the Environment Conservation Act, 73 of 1989;
 - v. Municipal by-laws and the National Veld and Forest Fire Act 101 of 1989
 - vi. Regulations in terms of the Conservation of Agricultural Resources Act, 43 of 1983.

The Common Law

3. The common law is the law developed by the courts as opposed to laws that are written in an act of Parliament. A principle has been developed in terms of the common law relating to neighbours and nuisance in terms of which the owner of land may not use his or her land in such a way that it impacts on the use and enjoyment by other land owners of their land. This is based on the Roman law principle *sic utere tuo ut alienum non laedas* but it is also contained within the concept of ubuntu.
4. If a landowner breaches the common law rule relating to neighbours and nuisance an aggrieved party may approach the court for an order compelling the landowner to remove the cause of the nuisance. This is normally done in the form of an interdict.

National Water Act No 36 of 1998

5. Section 151(1) of the National Water Act 36 of 1998 states that:

“No person may –

- (j) unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect a water resource.”

A “water resource” is defined in the National Water Act to include “a water course, surface water, estuary or aquifer”.

A “water course” is defined in the National Water Act to mean:

- “(a) a river or spring,
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse,

and a reference to a watercourse includes, where relevant, its bed and banks.”

6. Any person contravening s151(1) of the National Water Act is guilty of a criminal offence. It is therefore possible to institute criminal proceedings against an offending landowner or landuser.

7. In addition to criminal proceedings, section 155 of the National Water Act provides that the Minister or the concerned water management institution may apply to the High Court for an interdict or other appropriate order. This may include an order to discontinue the activity and to remedy the adverse effects of the contravention.
8. A stand of invasive alien plants exceeding 1 hectare in extent could be regarded as a plantation that is being grown without water use permit in terms of the National Water Act.

National Environmental Management Act No 107 of 1998

9. Section 28 of the National Environmental Management Act, 107 of 1998 states the following:

“Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring...”

The National Environmental Management Act makes it possible for the Director General of Environmental Affairs and Tourism or a provincial head of department or, if the powers have been delegated to it, a local authority to direct a person causing such pollution or damage to the environment to remove the cause. Should such a directive be ignored the Director General may adopt reasonable measures to remedy the situation and to recover from that person the costs thereby incurred.

Environment Conservation Act No 73 of 1989

10. Section 31A of the Environment Conservation Act, 73 of 1989 states that:

“If, in the opinion of the Minister or ...[other] authority concerned, any person performs any activity or fails to perform any activity as a result of which the environment is or may be seriously damaged, endangered or detrimentally affected, the Minister or ... [other] authority, as the case may be, may in writing direct such person –

- (a) to cease such activity; or
- (b) to take such steps as the Minister or ... [other] institution... may deem fit, within a period specified in the direction, with a view to eliminating, reducing or preventing the damage, danger or detrimental effect.

11. The Minister or other authority may further require the responsible person to rehabilitate any damage. Should the responsible person fail to do so the Minister or other authority may rehabilitate the damage and recover from the responsible person any expenditure incurred.

12. Failure to comply with a direction in terms of section 31A is a criminal offence in terms of section 29(3) of the Environment Conservation Act.

13. Municipal By-laws and the National Veld and Forest Fire Act 101 of 1998

14. Before dealing with each of these provisions it is necessary to mention that a legal obligation to control invading alien plants may also be created by the rules of Fire Protection Associations established in terms of the National Veld and Forest Fire Act 101 of 1998 and by municipal by-laws.

Conservation of Agricultural Resources Act No 43 of 1983

15. Regulations that have been promulgated in terms of the Conservation of Agricultural Resources Act, No 43 of 1983 further make it unlawful to allow various species of weeds and invader plants to grow.

GUIDE TO THE CONSERVATION OF AGRICULTURAL RESOURCES ACT, NO 43 OF 1983

The Conservation of Agricultural Resources Act regulates various activities that may have an impact on agricultural resources including water sources and deals directly with the combating of invasive alien plants.

The enforcement of the legislation is the responsibility of the “Executive Officer” who is a person appointed by the Minister or a person to whom a power has been delegated.

This legislation is binding on all land users

Who is a land user?

‘**landuser**’ is defined in the Act as the owner of land, and includes-

- (a) any person who has a personal or real right in respect of any land in his capacity as fiduciary, fideicommissary, servitude holder, possessor, lessee or occupier, irrespective of whether he resides thereon;
- (b) any person who has the right to cut trees or wood on land or to remove trees, wood or other organic material from land; and

not a person who carries on prospecting or mining activities

What is a weed or invader plant?

‘**invader plant**’ is defined in the Act as “a kind of plant which has under section 2(3) been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself sexually”.

‘**weed**’ is defined as “any kind of plant which has under section 2(3) been declared a weed, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually”.

In terms of the Act the Minister may by regulation declare any plant to be a weed or an invader plant for the purposes of this Act, either throughout the Republic or in one or more areas therein.

What plants have been declared weeds and invader plants?

Regulations were passed in 1984 in terms of which about 50 species were declared “weeds” or “invader plants”. This includes species such as mesquite, black wattle and a number of other species that the Working for Water Programme is clearing.

The Department of Agriculture has now published a draft amendment to these regulations.

The proposed amendment increases the number of species that are declared weeds and invader plants and also divides the weeds into three categories:

What are Category 1 plants?

- They are declared weeds.
- They may not occur on any land or on any inland water surface throughout the Republic.
- No person may:

- (a) sell, agree to sell or offer advertise, keep exhibit, transmit, send, convey or deliver for sale, or exchange for anything or dispose of to any person in any manner for a consideration, any weed, or
- (b) in any manner permit whatsoever disperse or cause or permit the dispersal of any weed from any place in the Republic to any place in the Republic

What are Category 2 plants?

- They are generally plants grown for commercial purposes but may also be used as a woodlot, shelter belt, building material, animal fodder, soil stabilisation or other beneficial function that may be determined;
- They are invader plants that may only be allowed to grow in demarcated areas.

What is a demarcated area?

- "**demarcated area**" is defined in the draft regulations as "any area demarcated by the Executive Officer as an area where invader plants of the kinds specified as Category 2 are established or are to be established and may be retained".
- An area in respect of which a water use license for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 36 of 1998 shall be deemed to have been demarcated in terms of these regulations.
- No area shall be demarcated for the growing of invader plants of a kind specified as Category 2 unless the land user is able to establish to the satisfaction of the Executive Officer that, as far as may be practicable:
 - (a) The invader plants shall be confined to such demarcated areas; and
 - (b) Controlled circumstances of cultivation of the invader plants shall prevail in the demarcated areas; and
 - (e) All steps are taken by the land user to curtail the spreading of the propagating material of the invader plants to land and inland water surfaces outside the demarcated areas; and
 - (f) Financial guarantees to the satisfaction of the Executive Officer are furnished by the land user for the cost of the control of any invader plants that may in the future grow outside the demarcated area from propagating material emanating from invader plants inside the demarcated area. The Executive Officer may dispense with the requirement for financial guarantees if the Executive Officer is satisfied that financial guarantees furnished by the land user in terms of any other law are adequate; and

What are Category 3 plants?

- Category 3 plants are invader plants that may continue to grow where they already exist.
- However, no new planting or trade or propagating of these plants is permitted.

What happens when plants occur in contravention of the regulations?

- If weeds or invader plants occur contrary to the provisions of these regulations, the land user must control those weeds or invader plants by means of any of the control methods that are appropriate for the species concerned and the ecosystem in which it occurs.
- Any action taken to control weeds or invader plants must be executed with caution and in a manner that will cause the least possible damage to the environment.
- Regulations 2 to 14 must be adhered to including the obtaining of written consents to cultivate virgin soil and to burn veld, the protection of land against erosion, the protection of vleis, marshes, water sponges and water courses and the restoration of degraded land.

What happens to land users who fail to comply with the regulations?

- It is a criminal offence to ignore the regulations and to allow species to grow in contravention of them. A criminal case may then be brought against the land user.
- If a land user does not comply with the regulations the Department may issue a directive setting a date by when the property must be cleared.
- The directive is binding on a successor-in-title (person to whom the property is later sold).
- If the directive is ignored the Department can clear the land or engage someone (such as Working for Water or an implementing agent or an emergent contractor) to do so.
It may be worth compiling a list of emergent contractors who can be employed for this purpose.
- The costs of this clearing can then be recovered from the land user and can also be registered against the title deeds of the property in terms of the Agricultural Credit Control Act. This is then like a mortgage bond. The property can't be sold until these moneys have been repaid.

The Department is considering introducing a prohibition on the transfer or sub-division of land unless it has first been certified as being free of weeds and invader plants. If accepted, this will not be included in the regulations but in the Act itself when it is amended later in the year.

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