

**PROPOSED UPGRADE OF THE HANS HOHEISEN WILDLIFE RESEARCH STATION,
MPUMALANGA**

*NEAS Ref: DEA/EIA/0001347/2012
Reference: 14/12/16/3/3/3/48*

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

Prepared for submission to:

The Department of Environmental Affairs

Prepared by:



On behalf of:

The University of Pretoria

July 2013

CONTENTS

CONTENTS.....	2
1. INTRODUCTION.....	3
2. RESPONSIBILITY FOR IMPLEMENTING THE EMPr.....	3
3. PROJECT LIFE CYCLE EMPr.....	4
3.1. The Project Planning Phase.....	4
3.2. The Construction Phase.....	6
3.3. The Operational Phase.....	13
4. WASTE MANAGEMENT PLAN.....	19
4.1. The Planning Phase.....	19
4.2. The Construction Phase.....	19
4.3. The Operational Phase.....	22
5. MANAGEMENT OF DISEASE RISK.....	24
5.1. The Planning Phase.....	25
5.1. The Operational Phase.....	25
6. STORM WATER MANAGEMENT PLAN.....	26
5.1. The Planning Phase.....	26
5.2. The Construction Phase.....	27
5.3. The Operational Phase.....	27
REFERENCES.....	28

1. INTRODUCTION

The anticipated impacts described in the Environmental Impact Report Basic Assessment Report (14/12/16/3/3/3/48) have been presented in a legible and easy to reference manner, so that the relevant role players at each phase of the project development (i.e. during project Planning, Construction and Operation) are aware of what mitigation and management actions must be adhered to, and for what reason.

Concerns and issues highlighted throughout the Environmental Impact Assessment process and assessed in terms of their impacts make up the majority of guidelines and restrictions which must be circulated to:

- The Planning and Design team during the Project Planning Phase;
- The Contractor during the Construction Phase and
- The Operator during the Operational Phase.

It should be noted that the guidelines listed hereunder are not to be considered finite, especially with respect to the Construction and Operational phases. Experience has shown that additional environmental issues are bound to arise as the project unfolds. When this happens, the Environmental Management Programme (EMPr) must be updated accordingly.

The Environmental Management Programme will ensure that the environmental commitments sketched as mitigation measures in the EIR are adhered to. In addition, the EMPr can be used to evaluate the effectiveness of mitigation measures.

2. RESPONSIBILITY FOR IMPLEMENTING THE EMPr

The overall responsibility of ensuring compliance with the Environmental Management Plan ultimately lies with the proponent. This relates to the Project Planning Phase, the Construction Phase and the Operational Phase.

The proponent must ensure that this responsibility to implement the EMPr is legally and timeously delegated to the relevant agents at the various project phases.

The contractor must ensure that all staff members, sub-contractors and suppliers understand and adhere to the Environmental Management Programme for the duration of the Construction phase, and must undertake to comply with its conditions.

The proponent must appoint an independent Environmental Control Officer (ECO) to audit the construction process on a regular basis. The ECO will be required to prepare reports and submit these to the competent authority and to the proponent.

During Operations, a regulatory control body (e.g. Operations ECO) must be delegated with the authority / responsibility to monitor, manage and maintain the development according to the Operational Management Plan.

The regulatory control body will be required to undertake audits and prepare reports and submit these to the competent authority and to the proponent.

When additional onsite issues arise, the regulatory control body must apply adaptive management and best practise principles. The control body must further ensure that a copy of all documentation with regards to safe operational procedures, permits and licences are kept up to date and are readily available.

3. PROJECT LIFE CYCLE EMPr

3.1. The Project Planning Phase

It is the responsibility of the proponent to ensure that the responsibility to implement the provisions of the EMPr is legally and timeously delegated to the relevant agents at the various project phases.

It is recommended that a copy of the EMPr be circulated to all members of the planning team, and that it is appended to all relevant project documentation, including the Tender and Construction Contract.

Aspect	Mitigation proposals
Ground water, soils & surface water	Register boreholes to be used for potable water extraction as per DWA requirements
	Apply for a Water Use Licence for the abstraction of the operational requirement of water as per DWA requirements.
	Ensure that water storage facilities are designed according to the demand requirements.
	Ensure that facility sewage system is designed according to the demand requirements.
	Ensure that the effluent treatment system is designed according to the demand requirements.
	Ensure that the treatment system for hazardous liquid waste is designed according to the demand requirements.
	The hazardous liquid waste treatment system should comprise of two holding tanks linked in series. The second tank is a backup to the first, and both back up to a drain system that flows back up to the lab when the tanks are full.
	Develop an Operational and Maintenance Program for liquid laboratory waste, addressing day to day maintenance and management actions, as well as emergency procedures.
	Develop an Operational Waste Management & Overflow Response Plan and reporting procedure to addresses mandatory provisions that must be set in place and implemented during day to day operation of, or should any accidental or other malfunction of the system result in spillage and or pollution of the environment.
	Develop operational guidelines for implementing Clean Technologies (solvents and detergents).
Institute a regional ground water testing regime, whereby boreholes at the facility and those within a 2km radius are quality tested. This quality testing will help to establish whether the facility and its functions are impacting on regional ground water quality. Establish test boreholes within a 2km radius at the onset of operations and test these to establish baseline data.	

	<p>Develop a Storm Water Management Plan (by suitably qualified professional) to ensure that runoff from storm water does not result in erosion at the collection areas and at the discharge points. In general, the following measures are recommended:</p> <ul style="list-style-type: none"> ○ Install cut off drains along boma's, animal enclosures and pens to ensure that storm water is diverted around these areas, and that runoff originating from within, remains inside ○ All roads and parking areas must have stable surfaces and channels lined (where possible) with vegetation. ○ Points of storm water discharge as well as any areas downstream where the risk of accelerated erosion could occur must be stabilised and energy dissipation measures specified. Ecological methods (gabions, perforated mattresses, vegetation, etc) are preferred. ○ Storm water infiltration must be promoted through minimising hard paved areas and using porous paving surfaces wherever possible. ○ Waste traps must be planned and included in the storm water design to catch litter conveyed by surface runoff. ○ The harvesting of storm water for appropriate uses (such as cistern water or for irrigation) must be planned for and incorporated into the design of the development where possible. <p>Specify the use of 'Green' building technology in ancillary buildings where possible. Measures include the following:</p> <ul style="list-style-type: none"> ○ Correctly orientate buildings (i.e. north to north east); ○ Shield direct solar radiation into buildings; ○ Reduce heat gains from lighting by increasing indirect daylighting into occupied spaces; ○ Reduce heat gains from lighting by using high efficiency fittings; ○ Provide double glazing where appropriate and utilise glass with lower solar radiation absorbing properties; ○ Create indoor spaces that induce natural ventilation with limited mechanical assistance; ○ Utilise cooler underground conditions to cool the air; ○ Direct air through ceilings to restrict heat gains into occupied space; ○ Dry the air – higher ambient temperatures are tolerated when the air is dry. ○ Where necessary, provide heating in winter by means of heat pumps. ○ As a general principle, low consumption solar or gas powered equipment will be favoured for geysers, electronics and stoves. <p>Specify water saving devices and technologies wherever possible. Measures include the following:</p> <ul style="list-style-type: none"> ○ Low flow shower heads and taps. ○ Grey water from ablutions, housing units and kitchens will be collected, treated and reused for dust control and irrigation in approved areas.
Air	<p>Apply for a Air Emissions License for the Incinerator as per the requirements of DEA (Air Quality).</p> <p>Ensure that the incinerator is designed according to the demand requirements.</p> <p>The installation of a Multiple Chamber Incinerator. Manufactured in the Republic of South Africa is recommended (this may be modified /</p>

	<p>customised to suit the operational requirements of the facility).</p> <p>The multiple chamber of the recommended incinerator includes automated combustion control, dry process neutralisation of acid gases, improved scrubbers, dry, high temperature ceramic filters and a host of other refinements that will burn without emitting dangerous levels of dioxins, furans, heavy metals, carbon monoxide, methane or any other harmful substances. With built-in emission control, air pollution is apparently minimized whilst greenhouse gases methane and carbon monoxide are eliminated and chloroform is destroyed.</p>
Biodiversity (flora)	Compile an alien invasive monitoring plan to prevent the colonisation and spread of alien invasive plant species.
Biodiversity (fauna)	Develop a procedure for dealing with animals encountered on the site including protected animals, dangerous animals and vermin.
Socio-economics	<p>Draw up a Construction Operations Plan indicating how the construction site will operate in terms of access, activities, phasing, etc.</p> <p>Develop a Code of Conduct for the operational phase and ensure that all personnel subscribe to this.</p>
Visual	<p>Retain and maintain natural vegetation in all areas outside of the development footprint.</p> <p>Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site footprint. This buffer may be within or behind the security fence.</p> <p>Limit the height of the incinerator chimney to a maximum of 15m</p> <p>Construct vegetated earth berms to screen the facility from the immediate neighbours, especially along the common boundary with Orpen Rest Camp in the north-east.</p> <p>Plan the ancillary buildings in such a way and in such a location that clearing of vegetation is minimised.</p> <p>Consolidate infrastructure and make use of already disturbed sites rather than pristine areas.</p> <p>Ensure that lighting for the proposed facility is planned and specified by a suitably qualified professional. Measures to reduce lighting impact at night include the following:</p> <ul style="list-style-type: none"> ○ Shield sources of light by physical barriers (walls, vegetation, or the structure itself). ○ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ○ Make use of minimum lumen or wattage in fixtures. ○ Make use of down-lighters, or shielded fixtures. ○ Make use of Low Pressure Sodium lighting or other types of low impact lighting. ○ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

3.2. The Construction Phase

It is the responsibility of the contractor to ensure that all staff members, sub-contractors and suppliers understand and adhere to the Environmental Management Programme for the duration of the Construction phase, and must undertake to comply with its conditions.

It is recommended that the contractor develop and roll out an obligatory awareness training course to ensure that all role players are aware of the EMP, its conditions and its requirements.

The function of ensuring compliance with the EMPr must be delegated to a person with knowledge of environmental and construction matters (i.e. an Environmental Control Officer (ECO)). The proponent must appoint an independent Environmental Control Officer (ECO) to audit the construction process on a regular basis. The ECO will be required to prepare reports and submit these to the competent authority and to the proponent.

Aspect	Mitigation proposals
Ground water, soils & surface water	Monitor the consumption of water on a monthly basis and keep up to date records.
	Ensure that all construction personnel are trained in water wise principles, and that they practise prudent use of water during the Construction phase.
	Clearly demarcate the construction work areas and prevent pedestrian and vehicular access into buffer areas.
	Ensure that sufficient numbers of mobile toilets are available on site and that these are located at least 100m away from any drainage line and beyond any buffer zone.
	Ensure that mobile toilets are maintained in a sanitary and operational state.
	Ensure that all potentially harmful substances (chemicals, oils, etc) are stored in locked stores on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
	Ensure that all potentially harmful substances are used and handled by qualified personnel on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
	Ensure that a spills containment kit is available on site and that personnel are trained in spills clean up procedures.
	Follow manufacturer's instruction when using potentially hazardous substances, especially in terms of quantities, time of application etc.
	Maintain site vehicles and equipment in an acceptable state of repair (these may not leak or smoke and must comply with SABS standards).
	Immediately clean leaks and spills of potentially harmful substances and dispose of as hazardous waste.
	Accidental spills must be attended to in accordance with the Occupational Health and Safety Act No. 85 of 1993 and details recorded in an on-site log book. The details would include date and locality of spill, distance to the nearest drainage line, type of material, estimated quantity of spill, contact details of the people involved, mitigation steps taken and results of any subsequent monitoring.
	Major spills must be reported to the Regional DWA office.
	Ensure that concrete and cement works are undertaken in specified areas only.
	Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.
	Install a drainage diversion system to divert clean runoff around areas of potential pollution, e.g. the contractors yard, vehicle maintenance areas, batching areas, workshops, chemical & fuel stores, etc.
Direct polluted runoff and waste water emanating from the construction site into a collection system (e.g. sump, attenuation dam, PVC porta-ponds, etc.) for treatment or collection and disposal.	
Ensure that rainwater containing pollutants does not run-off into natural areas and thus result in a pollution threat. Prevent storm water or contaminated water directly entering any watercourse.	

	All support operations (e.g. gravel and vehicle or equipment washing), should be done in areas that are clearly demarcated as such and contain appropriate catch pits.
	Pumps and other machinery requiring oil, diesel, etc., which are to remain in one position for longer than two days must be placed on drip trays.
	All vehicle and equipment maintenance and repair work must be carried out within an area designated for this purpose, equipped with necessary pollution containment measures.
	Ensure that all hazardous wastes (such as used oil, oil containers, chemical containers etc) are disposed of as hazardous waste.
	Ensure that all personnel are familiar with waste management requirements on site
	Collect and sort-at-source the different types of waste (recyclables, inert rubble, potentially harmful and non-recyclable general waste) by placing receptacles at specific points throughout the construction site
	Ensure that personnel make use of the receptacles provided
	Empty receptacles for disposal at least once per week, but more often if required
	Dispose of solid waste at the nearest, applicably licensed recycling centre, salvage yard or landfill site
	Undertake weekly site cleanup operations to maintain the site in a neat and litter-free state
	Implement and maintain a Storm Water Management Plan (by suitably qualified professional). In general, the following measures are recommended: <ul style="list-style-type: none"> ○ Install cut off drains along boma's, animal enclosures and pens to ensure that storm water is diverted around these areas, and that runoff originating from within, remains inside ○ Remove only vegetation essential for construction and do not allow any disturbance to the adjoining natural vegetation cover. ○ Ensure that measures are in place to control the flow of excess water so that it does not impact on the surface vegetation ○ The accumulation of water on the surface should be prevented. The drainage of the surface should be done in such a way that storm water will be led away quickly and efficiently without any erosion taking place. ○ Runoff from roads must be managed to avoid erosion and pollution problems ○ Prevent storm water or contaminated water directly entering any watercourse. ○ Install waste traps to catch litter conveyed by surface runoff. ○ Dissipate concentrated storm water flows through energy dissipaters or vegetated areas
	Ensure that the least amount of vegetation is removed ahead of construction. Preferably undertake clearing activities during the dry season in order to prevent erosion and siltation
	Properly programme site works and ensure that vegetation clearing does not take place prematurely and leave areas unnecessarily exposed / denuded.
	Repair all erosion damage as soon as possible. Do not allow erosion to develop on a large scale before effecting repairs.
	Excess rocks and boulders that are excavated from the construction site may be used for erosion protection work.

	Ensure that the construction site is rehabilitated using appropriate indigenous vegetation.
	Rehabilitation plans must be drawn up for all disturbed areas, and must be approved by the ECO.
	Rehabilitation must be implemented immediately upon completion of construction.
	Once construction is complete, obsolete roads should be obliterated by breaking the surface crust and erecting earth embankments to prevent erosion, while vegetation should be re-established.
	Conserve topsoil through pre-emptive stripping and stockpiling prior to the commencement of works in any area, pending reapplication during rehabilitation. Take care to remove the topsoil together with herbaceous material.
	Do not disturb, compact or disrupt topsoil stockpiles, and ensure that nothing is stored on them.
	Topsoil stockpiles should not exceed 1,5 m in height.
	The final trimmed levels of all areas must make provision for the specified depth of reapplied topsoil. Leave trimmed surfaces slightly rough to facilitate topsoil binding and the natural establishment of vegetation.
	Do not excavate until all required materials / services are on-site, to facilitate immediate laying of services / construction of subsurface infrastructure.
	Preferably undertake clearing activities during the dry season in order to prevent erosion and sedimentation.
	Compact backfilled trenches to prevent erosion.
	Upon the completion of construction activities in an area, all excess stockpiled building material will be removed completely from site and the area levelled.
	Monitor backfilled areas for erosion and remediate as required.
	Progressively rehabilitate (rip, scarify and plant) areas as soon as works have been completed.
	Cordon off rehabilitated areas and do not allow grazing or access into these areas until such time that re-vegetation was found to be successful.
	Regularly inspect all rehabilitated areas and implement remedial measures as required.
Air	Maintain site vehicles and equipment in an acceptable state of repair (these may not smoke and must comply with SABS standards).
	Construction vehicles transporting materials to and from the construction site must be covered to reduce the formation of dust.
	Maintain all site roads and repair these as required.
	Regularly spray construction and haul roads with water to reduce dust.
	All vehicles must be road-worthy and regularly serviced, and drivers must be qualified and made aware of the need for strict speed limits.
	Vegetate or cover long-term stockpiles of soil and fine spoil material to minimise the sources of dust pollution.
	Progressively rehabilitate (rip, scarify and plant) areas as soon as works have been completed.
	No open fires will be allowed anywhere on the site.
	No incineration or burning of waste is permitted on the site.
	Provide personnel with gas for cooking in designated and safe areas.
	A firebreak should be established around the perimeter of the site prior to the commencement of the construction phase.

	<p>The contractor should contact all of the adjacent farm owners prior to the commencement of the construction phase and ensure that he/she has the contact numbers so that they can be contacted in the event of a fire.</p> <p>Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced.</p> <p>Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, winter months.</p> <p>Ensure that the necessary fire fighting equipment is on site in terms of SABS 1200 and act in accordance with relevant legislative requirements.</p> <p>Contractor to provide fire-fighting training to selected construction staff.</p>
Biodiversity (flora)	<p>Plan construction so as to leave as much of the natural vegetation intact as possible.</p> <p>A vegetation / tree specialist should walk the final site layout to identify and mark all protected trees/plants that could be impacted upon prior to the start of any construction activities.</p> <p>Draw up a plan indicating the mapped positions of vegetation specimens to be conserved and which should be removed and replaced. Avoid the requirement to remove protected trees wherever possible. Demarcate specimens to be retained with danger tape and / or fencing as required. This barrier to be at least 2m from the stem of the specimen.</p> <p>A perimeter fence or suitable perimeter demarcation must be erected around the construction works area to prevent access to sensitive environs.</p> <p>Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.</p> <p>Maintain site demarcations in position until the cessation of construction work.</p> <p>Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas.</p> <p>Regulate and control movement over the site. Personnel, vehicles and equipment to move along designated routes.</p> <p>Where possible, required equipment and infrastructure should be placed within existing disturbed areas.</p> <p>Ensure that the least amount of vegetation is removed ahead of construction.</p> <p>Retain vegetation and soil within construction areas in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.</p> <p>No vegetation outside of the demarcated construction areas may be removed.</p> <p>Only wood from trees felled as part of the construction contract may be sold / made available for firewood.</p> <p>No large tree may be felled without the permission of the ECO.</p> <p>Demarcate specimens to be retained with danger tape and / or fencing as required. This barrier to be at least 2m from the stem of the specimen.</p> <p>No protected trees or plants may be removed without the relevant permits from the local authority.</p>

	Implement fines for the damage or destruction of marked and protected specimens. It is the contractor's responsibility to ensure that these are retained.
	Do not deface, paint or otherwise mark and / or damage natural features / vegetation on the site.
	Progressively rehabilitate (rip, scarify and plant) areas as soon as works have been completed.
	Cordon off rehabilitated areas and do not allow grazing or access into these areas until such time that re-vegetation was found to be successful.
	Regularly inspect all rehabilitated areas and implement remedial measures as required.
	Rehabilitation plans must be drawn up for all disturbed areas, and must be approved by the ECO. Rehabilitation must be implemented immediately upon completion of construction.
	Alien invasive species should be removed prior to construction to contain the spread of seeds in disturbed soils as well as downstream.
	Draw up a management and monitoring programme for invasive species detailing actions to prevent the establishment of invasive plants of site during construction. Implement management actions according to the management plan.
	Eradicate alien plants and carry out follow-up controls throughout construction to prevent spread into disturbed soils.
	All alien seedlings and saplings must be removed as they emerge or become evident. Manual / mechanical removal is preferred to chemical control.
	All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction site or general study area.
Biodiversity (fauna)	A faunal specialist should walk the final site layout to identify all possible burrows that could be impacted upon. Where possible, relocate specimens to outside of the development areas.
	Protected species occurring within the disturbed footprint of the facility (specifically the baboon spider, which is known to occur on the site) must be protected and relocated if necessary, whenever encountered on the site.
	Ensure that construction personnel are briefed on the potential occurrence of protected faunal species, what they look like, and where they are likely to be found. Personnel are to be instructed that these species are not to be hurt or destroyed if encountered. This applies specifically to the snakes, lizards and spiders (baboon spider), as these are often perceived to be vermin and pests.
	Personnel must be instructed to report the presence of protected species to the Contractor so that arrangements may be made to relocate these to adjacent bush areas.
	Develop a procedure for dealing with animals (including protected and dangerous animals and vermin) encountered on the site. Where necessary, call in professionals to remove the animals.
	Ensure that all personnel are aware of what the procedures for dealing with animals are. It is the contractor's responsibility to ensure that proper procedures are followed.
	Speed control measures must be implemented on site and in the surrounding area to reduce air pollution and animal mortality

	Construction activities should be limited to daylight hours and vehicles should remain on the designated roads at all times.
	Regulate and control movement over the site. Personnel, vehicles and equipment to move along designated routes.
	Construction personnel should be encouraged not to harm any wildlife.
	Pets and livestock should not be allowed on site. If pets are to be allowed on site, they should be isolated from the general wildlife and properly controlled.
Heritage	If archaeological or historical 'chance finds' are encountered, then work in the area must be halted, and the heritage specialist will assess the situation and make recommendations.
Socio-economics	Where reasonable and practical, the Contractor should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.
	Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
	The recruitment selection process should seek to promote gender equality and the employment of women wherever possible
	The contractor should develop a Code of Conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted.
	The contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft, poaching and trespassing on adjacent farms.
	Construction workers that breach the code of good conduct should be dismissed. All dismissals must comply with the South African labour legislation.
	Implement a policy that no employment will be available at the gate.
	The movement of construction workers on and off the site should be closely managed and monitored by the contractors.
	In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis, specifically construction workers who are not from Schmidtsdrift.
	The contractor should make the necessary arrangements for allowing workers from outside the area to return home over weekends. This would reduce the risk posed by construction workers to local family structures and social networks.
	No construction workers, with the exception of security personnel, should be permitted to stay overnight on the site.
	The housing of construction workers on the site should be limited to security personnel.
	In the event of a fire being caused by construction workers and or construction activities, the responsible contractor must compensate farmers for damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
	Implement strict access control measures and reserve right of admission into the site.
	Keep up-to-date telephone numbers of relevant emergency services on the site.

	Ensure that adequate emergency and first aid facilities / procedures are in place on the site.
	Ensure that adequate drinking water and ablutions are provided on site.
	Lines of communication must be established and maintained with local landowners so that issues and problems arising on the site and as a result of construction workers may be reported, discussed and resolved.
Visual	Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
	Reduce the construction period through careful logistical planning and productive implementation of resources.
	Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
	Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
	Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
	Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
	Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
	Ensure that all temporary structures, materials, waste and facilities used for construction activities are removed upon completion of the project.
	Rehabilitate all disturbed areas, construction areas, roads, slopes etc immediately after the completion of construction works.
Municipal services & traffic	Maintain all site roads and repair these as required.
	All vehicles must be road-worthy and regularly serviced, and drivers must be qualified and made aware of need for strict speed limits.
	The movement of construction vehicles should be confined to the period of 08h00 and 17h00. This is aimed at reducing the potential noise impacts on local tourism operations
	The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor.

3.3. The Operational Phase

During Operations, a regulatory control body (e.g. Operations ECO or Operator) must be delegated with the authority / responsibility to monitor, manage and maintain the development according to the Operational Management Plan.

The regulatory control body will be required to undertake audits and prepare reports and submit these to the competent authority and to the proponent.

When additional onsite issues arise, the regulatory control body must apply adaptive management and best practise principles. The control body must further ensure that a copy of all documentation with regards to safe operational procedures, permits and licences are kept up to date and are readily available.

It is the responsibility of the regulatory control body to ensure that all staff members, sub-contractors and suppliers understand and adhere to the Environmental Management

Programme for the duration of the Operational phase, and must undertake to comply with its conditions.

It is recommended that the regulatory control body develop and roll out an obligatory awareness training course to ensure that all role players are aware of the EMPr, its conditions and its requirements. Refresher courses should be presented as required, on an ongoing basis.

Aspect	Mitigation proposals
Ground water, soils & surface water	Monitor the consumption of water on a monthly basis and keep up to date records.
	Ensure that consumption does not exceed permitted quantities. Take action to reduce consumption if necessary.
	Install a leak detection system, and promptly attend to leaks as required.
	Ensure that all facility staff is trained in water wise principles, and that they practise prudent use of water at all times.
	Ensure that boma's, enclosures and pens are not overpopulated.
	Establish a daily routine of cleanup in all animal enclosure areas, removing faeces and other waste from boma's and pens and replacing animal bedding as required.
	Ensure that faeces and soiled bedding is disposed of in the proper manner (i.e. incineration) as soon as possible after removal, or shortly thereafter.
	Ensure that temporary storage of faeces and soiled bedding is limited. Where temporary storage of waste is unavoidable, ensure that the waste is stored on an impermeable, bunded surface equipped with runoff containment measures.
	Ensure that the facility sewage system is maintained in a sanitary and operational state.
	Ensure that the facility sewage system is not overloaded, and that it functions within its design capacity. Take action to reduce output or increase capacity if necessary.
	Regularly check the facility sewage system (preferably monthly) to ensure it is functionally sound. If necessary, employ the services of a professional, suitably qualified independent body.
	Implement repairs immediately upon detection of a failure or fault. Replace old, inadequate and failing equipment as required.
	Ensure that the effluent treatment system, including evaporation dams, are not overloaded and that no overflows occur. Take action to reduce output or increase capacity if necessary.
	Ensure that the effluent treatment system is maintained in a sanitary and operational state.
	Regularly check the effluent treatment system (preferably monthly) to ensure that the system is functionally sound.
	Undertake monthly wastewater monitoring to ensure that the output quality of the water complies with the minimum standards as prescribed by DWA.
Wastewater to be used for irrigation must comply with the following standards: <ul style="list-style-type: none"> • electrical conductivity does not exceed 200 milliSiemens per metre (mS/m) • pH is not less than 6 or more than 9 pH units • Chemical Oxygen Demand (COD) does not exceed 400mg/l after removal of algae • Faecal coliforms do not exceed 1000 000 per 100 ml 	

	Ensure that the treatment system for hazardous liquid waste is maintained in a sanitary and operational state.
	Ensure that the treatment system for hazardous liquid waste is not overloaded and that no overflows occur. Take action to reduce output or increase capacity if necessary.
	Regularly check the treatment system for hazardous liquid waste (preferably monthly) to ensure that the system is functionally sound.
	Develop an Operational and Maintenance Program for liquid laboratory waste, addressing day to day maintenance and management actions, as well as emergency procedures.
	Develop an Operational Waste Management & Overflow Response Plan and reporting procedure to addresses mandatory provisions that must be set in place and implemented during day to day operation of, or should any accidental or other malfunction of the system result in spillage and or pollution of the environment.
	Undertake ground water quality testing yearly, at the same time of year and keep up to date records.
	Set up a schedule of general waste collection by local contractor, dumping the waste at the closest registered waste disposal facility.
	Set up a schedule of medical and hazardous waste collection by specialist contractor, for incineration at the Onderstepoort facility in Pretoria and at the nearest registered waste disposal facility respectively
	Maintain the storm water management system for the facility on an ongoing basis and ensure that this is always in good working order. The following is of relevance: <ul style="list-style-type: none"> ○ Install cut off drains along boma's, animal enclosures and pens to ensure that storm water is diverted around these areas, and that runoff originating from within, remains inside ○ Ensure that measures are in place to control the flow of excess water so that it does not impact on the surface vegetation ○ The accumulation of water on the surface should be prevented. The drainage of the surface should be done in such a way that storm water will be led away quickly and efficiently without any erosion taking place. ○ Runoff from roads must be managed to avoid erosion and pollution problems. ○ Prevent storm water or contaminated water directly entering any watercourse. ○ All waste traps within the storm water system will be emptied / cleaned regularly to ensure their efficient functioning. ○ Dissipate concentrated storm water flows through energy dissipaters or vegetated areas
	Repair all erosion damage as soon as possible. Do not allow erosion to develop on a large scale before effecting repairs.
	Monitor all rehabilitated areas for at least a year following the completion of rehabilitation works for failure of vegetation to establish and / or erosion. Immediately implement remedial measures as required.
	Cordon off rehabilitated areas and do not allow grazing or access into these areas until such time that re-vegetation was found to be successful.
	Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundaries of the facility and of demarcated activity areas.
	Erect and maintain adequate fences around all animal boma's and enclosures to prevent animal access to sensitive environs.

	Subdivide and rotate use of encampments and grazing areas, allowing depleted encampments to lie unused and recover for a season. Set a rotation programme to ensure that all camps are allowed to 'rest'.
	Regulate and control movement over the site. Personnel, vehicles and equipment to move along designated routes. Formalise access roads and disallow off-road driving as far as possible.
	Ensure that all solvents, detergents, chemicals, fuels etc are stored in locked stores on bunded surfaces.
	Ensure that all potentially hazardous substances are used and handled by qualified personnel. Follow manufacturer's instruction when using potentially hazardous substances, especially in terms of quantities, time of application etc.
	Ensure that a spills containment kit is available on site and that personnel are trained in spills clean up procedures
	Maintain site vehicles and equipment in an acceptable state of repair (these may not leak or smoke and must comply with SABS standards).
	Ensure that all maintenance and servicing of vehicles and equipment is undertaken on bunded surfaces with appropriate runoff containment measures installed.
	Ensure that all hazardous wastes (such as used oil, oil containers, chemical containers etc) are disposed of as hazardous waste
	Immediately clean leaks and spills of potentially harmful substances and dispose of as hazardous waste.
	Accidental spills must be attended to in accordance with the Occupational Health and Safety Act No. 85 of 1993 and details recorded in an on-site log book. The details would include date and locality of spill, distance to the nearest drainage line, type of material, estimated quantity of spill, contact details of the people involved, mitigation steps taken and results of any subsequent monitoring.
	Develop operational guidelines for implementing Clean Technologies (solvents and detergents). The following is of relevance: <ul style="list-style-type: none"> ○ Make use of minimal amounts of environmentally friendly solvents and detergents, only where necessary. ○ Ensure that all products are used according to manufacturer's instructions and that staff are trained in the use and handling thereof. ○ Ensure that the disposal of wash water is in accordance with operational policy and that this wash water does not threaten ground water or surface water systems or create erosion problems. ○ Maintain all buffer zones to trap sediments.
	Ensure that all personnel are familiar with waste management requirements on site. Empty receptacles for disposal at least once per week, but more often if required.
	Collect and sort-at-source the different types of waste (recyclables, inert rubble, hazardous and non-recyclable general waste) by placing receptacles at specific points throughout the facility.
	Ensure that personnel make use of the waste receptacles provided
	Undertake regular cleanups and litter removal across the entire site
	Recyclables and general waste must be collected from the development by reputable companies on a regular basis
Air	Limit the use of the incinerator to organic waste (i.e. animal carcasses, body fluids, bedding and faeces). Do not incinerate non-organics, plastic

	containers etc.
	Encourage group travel and lift clubs wherever possible.
	Maintain all roads in good condition to prevent dust and erosion.
	Regularly spray gravel roads with water to reduce dust.
	No open fires will be allowed anywhere on the site
	A firebreak should be maintained around the perimeter of the site at all times.
	The operator should remain in contact with all of the adjacent farm owners to ensure that he/she has the contact numbers so that they can be contacted in the event of a fire.
	The operator must ensure that adequate fire fighting equipment is on-site.
	The operator must ensure that fire-fighting training is provided to selected staff.
	Maintain site vehicles and equipment in an acceptable state of repair (these may not smoke and must comply with SABS standards).
	All vehicles must be road-worthy and regularly serviced, and drivers must be qualified and made aware of the need for strict speed limits.
Biodiversity (flora)	No unauthorised access is permitted to buffer areas or any natural areas outside of the facility footprint.
	Identify protection-worthy tree specimens and tree clumps within the enclosures and cordon these off using suitable fencing before bulk feeders are introduced into the enclosures.
	Regulate and control movement over the site. Personnel, vehicles and equipment to move along designated routes.
	The internal road network should be maintained as gravel tracks that allow for faunal dispersal and minimize fragmentation of ecologically sensitive areas.
	No wood may be collected for firewood or any other purpose, and no large tree may be felled without the permission of the ECO.
	Ensure that all conserved species and specimens are suitably protected for the duration of the operational phase.
	Compile and implement an alien invasive monitoring plan to prevent the colonisation and spread of alien invasive plant species.
	All alien seedlings and saplings must be removed as they emerge or become evident. Manual / mechanical removal is preferred to chemical control.
	Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Manual / mechanical removal is preferred to chemical control.
	Limit herbicide and pesticide use to non-persistent, immobile products and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
	Follow manufacturer's instruction when using chemical methods, especially in terms of quantities, time of application etc. Ensure that only properly trained people handle and make use of chemicals.
	All operational vehicles and equipment (including delivery and waste removal vehicles) should be free of plant material. All equipment and vehicles should be thoroughly cleaned prior to access on to the site. The Kruger National Park's policy on importing feedstuffs, such as lucerne, into protected areas must be adhered to.
Biodiversity (fauna)	Maintain a game fence or suitable equivalent around the perimeter of the facility. This fence should, however, be designed to allow access by

	small mammals, tortoises etc.
	Protected species occurring within the disturbed footprint of the facility (pecifically the baboon spider, which is known to occur on the site) must be protected and reloacted if necessary, whenever encountered on the site.
	Ensure that personnel are briefed on the potential occurrence of protected faunal species, what they look like, and where they are likely to be found. Personnel are to be instructed that these species are not to be hurt or destroyed if encounteded. This applies specifically to the snakes, lizards and spiders (baboon spider), as these are often peceived to be vermin and pests.
	Personnel must be instructed to report the presence of protected species so that arrangements may be made to relocate these to adjacent bush areas.
	Keep noise to a minimum at all times, and minimise lighting of the facility at night.
	Speed control measures must be implemented on site and in the surrounding area to reduce air pollution and animal mortality.
	Maintenance activities should be limited to daylight hours and vehicles should remain on the designated roads at all times.
	Develop a procedure for dealing with protected animals, dangerous animals and vermin. Where necessary, call in professionals to remove the animals.
	Ensure that all personnel are aware of what the procedures for dealing with animals are. It is the contractor's responsibility to ensure that proper procedures are followed.
	Staff should be encouraged not to harm any wildlife.
	Pets and livestock should not be allowed on site. If pets are to be allowed on site, they should be isolated from the general wildlife and properly controlled.
Socio-economics	The operator must develop a Code of Conduct for the operational phase and ensure that all personnel subscribe to this.
	The movement of visitors and personnel on and off the site must be closely managed and monitored by the operator.
	The operator is responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.
	Lines of communication must be established and maintained with local landowners so that issues and problems arising may be reported, discussed and resolved
	Schedule regular incineration times in consultation with local tourism operators, and agree on times that would least incovenience neighbours.
Visual	Maintain the general appearance of the facility as a whole, including roads and servitudes.
	Retain and maintain natural vegetation in all areas outside of the development footprint.
	Minimise lighting of the facility at night
	Respect the high quality of the visual environment, and endeavour to maintain these through responsive operations, such as programming of deliveries, incineration and other potentially visually disruptive activities to times that are not important for tourism.

4. WASTE MANAGEMENT PLAN

This Waste Management Plan seeks to specify the procedure for the management, control and disposal of items designated as waste material emanating from the Hans Hoheisen Wildlife Research Station. The following is a list of the different categories of waste material that will be generated during the construction and operational phases of the proposed development:

- recyclable materials (including organic waste)
- inert rubble
- general waste
- liquid waste
- potentially hazardous material
- hazardous waste (including medical waste)

Procedures for the management, control and disposal of the listed items are described in this plan. The plan is aligned with the Project Lifecycle EMPr, and is therefore structured into a Planning, Construction and Operational Phase for ease of use.

As this section forms part of the EMPr, the overall responsibility of ensuring compliance with the Waste Management Plan ultimately lies with the proponent.

The Environmental Control Officer (ECO) as part of his monthly audit report, must address all aspects of waste management as a specific item.

4.1. The Planning Phase

- Ensure that facility sewage system is designed according to the demand requirements.
- Ensure that the effluent treatment system is designed according to the demand requirements.
- Ensure that the treatment system for hazardous liquid waste is designed according to the demand requirements. The hazardous liquid waste treatment system should comprise of two holding tanks linked in series. The second tank is a backup to the first, and both back up to a drain system that flows back up to the lab when the tanks are full.
- Ensure that the incinerator is designed according to the demand requirements. The installation of a Multiple Chamber Incinerator. Manufactured in the Republic of South Africa is recommended (this may be modified / customised to suit the operational requirements of the facility). The multiple chamber of the recommended incinerator includes auto-mated combustion control, dry process neutralisation of acid gases, improved scrubbers, dry, high temperature ceramic filters and a host of other refinements that will burn without emitting dangerous levels of dioxins, furans, heavy metals, carbon monoxide, methane or any other harmful substances. With built-in emission control, air pollution is apparently minimized whilst greenhouse gases methane and carbon monoxide are eliminated and chloroform is destroyed.
- Develop an Operational and Maintenance Program for liquid laboratory waste, addressing day to day maintenance and management actions, as well as emergency procedures.
- Develop an Operational Waste Management & Overflow Response Plan and reporting procedure to addresses mandatory provisions that must be set in place and implemented during day to day operation of, or should any accidental or other malfunction of the system result in spillage and or pollution of the environment.
- Waste traps must be planned and included in the storm water design to catch litter conveyed by surface runoff.

4.2. The Construction Phase

General Management and Housekeeping:

- The contractor will take responsibility for the collection and disposal of all construction waste generated during the construction period.
- The contractor will ensure that all personnel are familiar with waste management requirements on site.
- The contractor will co-ordinate the collection and sorting on the site of all:
 - recyclable materials (organic, glass, metal, plastic, paper, wood)
 - inert rubble (uncontaminated soil, rock, concrete and building rubble)
 - potentially harmful waste (oils, solvents and other chemicals)
 - non-recyclable general waste.
- This collection and sorting will be done by placing receptacles at specific points throughout the construction site and ensuring that all personnel make use of the bins provided.
- The contractor will ensure that all personnel make use of the receptacles provided.
- Receptacles will be emptied for disposal at least once per week, but more often if required.
- Housekeeping activities must minimize the amount of waste and maximize the amount of recyclable material that can be efficiently gathered at the local collection points. The contractor should appoint a representative who will oversee and manage the field operations with regards to housekeeping and waste management. Any issues identified by this person will be discussed during internal construction meetings.
- Undertake weekly site cleanup operations to maintain the site in a neat and litter-free state.
- The contractor must co-ordinate the transportation of all waste categories to the nearest, applicably licensed recycling centre, salvage yard or landfill site, and pay the necessary fees required for disposal there. The contractor may undertake to do this work using his own resources, or he may sub-contract a Waste Management Firm for the duration of the construction phase.
- No incineration or burning of waste is permitted on the site.
- The contractor must provide a waste material worksheet illustrating the types of waste and the deposition pathway (recycling, dump site, etc). The contractor must further provide an estimation of the waste material types and quantities to be generated and balance these with actual quantities.
- A record of each disposal activity (permits, landfill receipts, weights, weight tickets, and any other receipts) must be maintained at the site office by the contractor.
- The contractor is responsible for all licenses, permits, and taxes needed to comply with local authority requirements in terms of waste disposal emanating from the construction site.
- All waste will be transported properly (i.e. without illicit dumping, spillage of waste or release of odours en route).
- Proof of waste disposal at the nearest registered waste disposal site must be provided as and when required.

Recyclable Material:

- All material for recycling will be placed in designated containers which must be labelled clearly. Material must be stored and handled so that it is acceptable to the recycler. This 'sorting at source' approach will ease unnecessary double handling.
- All materials not identified in the material disposal table categories will be considered general waste.

Inert Rubble:

- A dedicated area must be created on the site for the temporary storage of construction waste. This site must be 100m away from any drainage line and must not be visually obtrusive for by-passing traffic.

- Excess concrete from mixing will be deposited in a designated area awaiting removal to an approved landfill site.

General Waste:

- Solid waste will be disposed of at the nearest, applicably licensed recycling centre, salvage yard or landfill site.

Liquid Waste:

- Ensure that sufficient numbers of mobile toilets are available on site and that these are located at least 100m away from any drainage line and beyond any buffer zone.
- Ensure that mobile toilets are maintained in a sanitary and operational state.
- Ensure that concrete and cement works are undertaken in specified areas only.
- Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.
- Install a drainage diversion system to divert clean runoff around areas of potential pollution, e.g. the contractor's yard, vehicle maintenance areas, batching areas, workshops, chemical & fuel stores, etc.
- Direct polluted runoff and waste water emanating from the construction site into a collection system (e.g. sump, attenuation dam, PVC porta-ponds, etc.) for treatment or collection and disposal.
- Ensure that rainwater containing pollutants does not run-off into natural areas and thus result in a pollution threat. Prevent storm water or contaminated water directly entering any watercourse.
- All support operations (e.g. gravel and vehicle or equipment washing), should be done in areas that are clearly demarcated as such and contain appropriate catch pits.

Potentially hazardous material:

- The Contractor must comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials.
- The contractor must provide the ECO with a list of all petroleum, chemical, harmful and hazardous substances and materials on site, together with storage, handling and disposal procedures for these materials.
- The team responsible for handling potentially harmful waste must at all times adhere to Public Health and Safety Legislation and Policies.
- Ensure that all potentially harmful substances (chemicals, oils, etc) are stored in locked stores on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
- Ensure that all potentially harmful substances are used and handled by qualified personnel on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
- Ensure that a spills containment kit is available on site and that personnel are trained in spills clean up procedures.
- Immediately clean leaks and spills of potentially harmful substances and dispose of as hazardous waste.
- Accidental spills must be attended to in accordance with the Occupational Health and Safety Act No. 85 of 1993 and details recorded in an on-site log book. The details would include date and locality of spill, distance to the nearest drainage line, type of material, estimated quantity of spill, contact details of the people involved, mitigation steps taken and results of any subsequent monitoring.
- Major spills must be reported to the Regional DWA office.

- Pumps and other machinery requiring oil, diesel, etc., which are to remain in one position for longer than two days must be placed on drip trays.
- All vehicle and equipment maintenance and repair work must be carried out within an area designated for this purpose, equipped with necessary pollution containment measures.

4.3. The Operational Phase

General Management and Housekeeping:

- The operator will take responsibility for the collection, sorting and disposal of all general waste generated during the operational life of the plant.
- This collection and sorting will be done by placing receptacles at specific points throughout the plant site and ensuring that all personnel make use of the bins provided.
- The operator will ensure that all personnel make use of the receptacles provided.
- Receptacles will be emptied for disposal at least once per week, but more often if required.
- Housekeeping activities must minimize the amount of waste and maximize the amount of recyclable material that can be efficiently gathered at the local collection points. The operator should appoint a representative who will oversee and manage the field operations with regards to housekeeping and waste management.
- Undertake weekly site cleanup operations to maintain the site in a neat and litter-free state.
- The operator must co-ordinate the transportation of all waste categories to the nearest, applicably licensed recycling centre, salvage yard or landfill site, and pay the necessary fees required for disposal there. The operator may sub-contract a Waste Management Firm for the duration of the operational phase.
- All waste will be transported properly (i.e. without illicit dumping, spillage of waste or release of odours en route).
- All waste traps within the storm water system will be emptied / cleaned regularly to ensure their efficient functioning.

Recyclable Material:

- All material for recycling will be placed in designated containers which must be labelled clearly. Material must be stored and handled so that it is acceptable to the recycler. This 'sorting at source' approach will ease unnecessary double handling.
- All materials not identified in the material disposal table categories will be considered general waste.

General Waste:

- Solid waste will be disposed of at the nearest, applicably licensed recycling centre, salvage yard or landfill site.
- Set up a schedule of general waste collection by local contractor, dumping the waste at the closest registered waste disposal facility.

Liquid Waste:

- Ensure that the facility sewage system is maintained in a sanitary and operational state.
- Install cut off drains along boma's, animal enclosures and pens to ensure that storm water is diverted around these areas, and that runoff originating from within, remains inside
- Grey water from ablutions and tea kitchens will not be recycled for potable use, but will be collected in a dedicated collection tank and used for dust control and irrigation in approved areas.

Potentially hazardous material:

- The operator must comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials.
- The operator must keep a list of all petroleum, chemical, harmful and hazardous substances and materials on site, together with storage, handling and disposal procedures for these materials.
- The team responsible for handling potentially harmful waste must at all times adhere to Public Health and Safety Legislation and Policies.
- Ensure that all potentially harmful substances (chemicals, oils, etc) are stored in locked stores on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
- Ensure that all potentially harmful substances are used and handled by qualified personnel on dry bunded surfaces at least 100m away from any drainage line and beyond any buffer zone.
- Ensure that a spills containment kit is available on site and that personnel are trained in spills clean up procedures.
- Immediately clean leaks and spills of potentially harmful substances and dispose of as hazardous waste.
- Accidental spills must be attended to in accordance with the Occupational Health and Safety Act No. 85 of 1993 and details recorded in an on-site log book. The details would include date and locality of spill, distance to the nearest drainage line, type of material, estimated quantity of spill, contact details of the people involved, mitigation steps taken and results of any subsequent monitoring.
- Major spills must be reported to the Regional DWA office.
- Pumps and other machinery requiring oil, diesel, etc., which are to remain in one position for longer than two days must be placed on drip trays.
- All vehicle and equipment maintenance and repair work must be carried out within an area designated for this purpose, equipped with necessary pollution containment measures.
- Maintain site vehicles and equipment in an acceptable state of repair (these may not leak or smoke and must comply with SABS standards).
- Ensure that all hazardous wastes (such as used oil, oil containers, chemical containers etc) are disposed of as hazardous waste
- Immediately clean leaks and spills of potentially harmful substances and dispose of as hazardous waste.

Hazardous Waste:

- Ensure that boma's, enclosures and pens are not overpopulated.
- Establish a daily routine of cleanup in all animal enclosure areas, removing faeces and other waste from boma's and pens and replacing animal bedding as required.
- Ensure that faeces and soiled bedding is disposed of in the proper manner (i.e. incineration) as soon as possible after removal, or shortly thereafter.
- Ensure that temporary storage of faeces and soiled bedding is limited. Where temporary storage of waste is unavoidable, ensure that the waste is stored on an impermeable, bunded surface equipped with runoff containment measures.
- Ensure that the facility sewage system is maintained in a sanitary and operational state.
- Ensure that the facility sewage system is not overloaded, and that it functions within its design capacity. Take action to reduce output or increase capacity if necessary.
- Regularly check the facility sewage system (preferably monthly) to ensure it is functionally sound. If necessary, employ the services of a professional, suitably qualified independent body.

- Implement repairs immediately upon detection of a failure or fault. Replace old, inadequate and failing equipment as required.
- Ensure that the effluent treatment system, including evaporation dams, are not overloaded and that no overflows occur. Take action to reduce output or increase capacity if necessary.
- Regularly check the effluent treatment system (preferably monthly) to ensure that the system is functionally sound.
- Undertake monthly wastewater monitoring to ensure that the output quality of the water complies with the minimum standards as prescribed by DWA.
- Wastewater to be used for irrigation must comply with the following standards:
 - electrical conductivity does not exceed 200 milliSiemens per metre (mS/m)
 - pH is not less than 6 or more than 9 pH units
 - Chemical Oxygen Demand (COD) does not exceed 400mg/l after removal of algae
 - Faecal coliforms do not exceed 1000 000 per 100 ml
- Ensure that the treatment system for hazardous liquid waste is maintained in a sanitary and operational state.
- Ensure that the treatment system for hazardous liquid waste is not overloaded and that no overflows occur. Take action to reduce output or increase capacity if necessary.
- Regularly check the treatment system for hazardous liquid waste (preferably monthly) to ensure that the system is functionally sound.
- Develop an Operational and Maintenance Program for liquid laboratory waste, addressing day to day maintenance and management actions, as well as emergency procedures.
- Develop an Operational Waste Management & Overflow Response Plan and reporting procedure to address mandatory provisions that must be set in place and implemented during day to day operation of, or should any accidental or other malfunction of the system result in spillage and or pollution of the environment.
- Undertake ground water quality testing yearly, at the same time of year and keep up to date records.
- Limit the use of the incinerator to organic waste (i.e. animal carcasses, body fluids, bedding and faeces). Do not incinerate non-organics, plastic containers etc
- Set up a schedule of medical and hazardous waste collection by specialist contractor, for incineration at the Onderstepoort facility in Pretoria and at the nearest registered waste disposal facility respectively

5. MANAGEMENT OF DISEASE RISK

The purpose of the Management Plan for Disease Risk is to specify general guidelines and principles for operations at the Hans Hoheisen Wildlife Research Station so as to:

- Prevent Infectious Diseases from Spreading from the facility;
- Prevent Zoonotic Escape from Disease Projects;
- Ensure Sample Security;
- Limit introduction of disease into the facility;
- Prevent animals in the projects from escaping from the facility;
- Preserve a good public image;
- Ensure management relevance of the research facilities;
- Comply with Veterinary Laws and Other legislation and
- Ensure lab and chemical security.

Procedures for the management and control of disease risk, as recommended by Dr Markus Hofmeyr in his *Independent Opinion on the potential disease risk of the proposed upgrades (to both humans and animals) at the Hans Hoheisen Wildlife Research Station* (May 2013) are described in this plan. The provisions listed in this section go hand in glove with the following

manuals and protocols, which are already in use at the facility (and which have been included as appendices to the EIR):

- *Laboratory Safety Manual of the Department of Veterinary Tropical Diseases (Faculty of Veterinary Science, University of Pretoria (UP));*
- *Laboratory Chemical Disposal Procedure (Oricol Environmental Services)*
- *Medical Waste Disposal Procedure (Oricol Environmental Services)*

The plan is aligned with the Project Lifecycle EMP, and is therefore structured into a Planning, Construction and Operational Phase for ease of use.

As this section forms part of the EMP, the overall responsibility of ensuring compliance with the Management Plan for Disease Risk ultimately lies with the proponent.

5.1. The Planning Phase

Develop a Management Plan for Disease Risk (by suitably qualified professional) to ensure that the facility results in no disease risk for animals outside of the facility or for humans, and that no pathogens are able to escape into the surrounding environment.

5.1. The Operational Phase

Implement and maintain a Management Plan for Disease Risk (by suitably qualified professional). In general, the following measures are recommended:

- Control of samples;
- Proper facility Bio- Security;
- Project separation;
- Bio-Safety and proper management of waste;
- Proper standard operating procedure for feeding and handling of animals in the facilities;
- Projects that deal with highly infectious diseases must be in isolated facilities with separate staff with proper Bio-Security (including clothes and washing facilities);
- Proper incinerator to destroy infected animal parts and materials;
- Projects dealing with potential zoonotic diseases need to be managed with caution, proper education of staff, especially staff feeding animals in the project;
- Samples need to be managed with best practice applied;
- Necessary permits and laboratory Bio-Security is crucial to ensure samples do not become a source of disease transmission;
- Disease regulations applicable to sample movement and security must be adhered to;
- Staff working in facility will require health checks, especially staff feeding and handling animals;
- Visitor contact with animals need to be restricted and screened;
- Electric fencing surrounding the facility needs to be maintained and checked daily;
- Any stray animal into the facility needs to be removed - Bio-Security of facilities and project boma's is critical to avoid introduction of disease via stray animals;
- Ensure that animals that have been infected for disease study do not escape from the facility;
- Proper Bio-Security of facilities, proper protocols for feeding and managing animals in boma's/cages;
- Proper project registration - research objectives and priorities will be needed to help guide project registration and importance;
- Animal use and care;
- Clean and well maintained facilities with clear handling and feeding operating procedures for animals in facilities;

- Well managed visitor access to projects;
- Publication produced as soon as possible during and after projects completed;
- Develop and implement projects that are relevant and have been discussed within the Science- Management context;
- All disease research needs to take place within the context of Animal Disease Laws and Occupation Health and Safety Requirements;
- The project registration process, operating procedures and partners with relevant research projects will help mitigate legal issues that may arise when doing research on diseases, especially controlled and zoonotic diseases;
- State Veterinary involvement with controlled diseases;
- Labs need to be managed according to relevant lab activities – infectious disease samples with potential high risk of transmission require labs equipped with correct laminar and Bio-Safety restrictions flow in unit for proper emergency and access procedures;
- Chemicals need to be transported, stored and handled as per proper requirements and level of toxicity;
- Washing facilities for rinsing off spilt chemicals must be in place;
- Proper disposal of chemical and lab by-products must be in line with ecological and Bio-Sanitary Standards.

6. STORM WATER MANAGEMENT PLAN

The purpose of the Storm Water Management Plan is to specify general guidelines and principles for storm water management within the Hans Hoheisen Wildlife Research Station so as to ensure that the increased volumes of storm water from hard surfaces, roofs etc do not result in ecological damage and erosion.

Procedures for the management and control of storm water are described in this plan. The plan is aligned with the Project Lifecycle EMPr, and is therefore structured into a Planning, Construction and Operational Phase for ease of use.

As this section forms part of the EMPr, the overall responsibility of ensuring compliance with the Storm Water Management Plan ultimately lies with the proponent.

The Environmental Control Officer (ECO) as part of his monthly audit report, must address all aspects of waste management as a specific item.

5.1. The Planning Phase

Develop a Storm Water Management Plan (by suitably qualified professional) to ensure that runoff from storm water does not result in erosion at the collection areas and at the discharge points. In general, the following measures are recommended:

- Install cut off drains along boma's, animal enclosures and pens to ensure that storm water is diverted around these areas, and that runoff originating from within, remains inside.
- All roads and parking areas must have stable surfaces and channels lined (where possible) with vegetation.
- Points of storm water discharge as well as any areas downstream where the risk of accelerated erosion could occur must be stabilised and energy dissipation measures specified. Ecological methods (gabions, perforated mattresses, vegetation, etc) are preferred.
- All activities that affect surface drainage should be designed so as to ensure that storm water runoff does not lead to excessive surface erosion problems on the proposed site.

- Storm water infiltration must be promoted through minimising hard paved areas and using porous paving surfaces wherever possible.
- Rainwater runoff from roofs and panels should be directed into natural areas rather than into storm water drains wherever possible.
- Waste traps must be planned and included in the storm water design to catch litter conveyed by surface runoff.
- The harvesting of storm water for appropriate uses (such as cistern water or for irrigation) must be planned for and incorporated into the design of the development where possible.

5.2. The Construction Phase

Implement and maintain a Storm Water Management Plan (by suitably qualified professional). In general, the following measures are recommended:

- The protective buffer around the non-perennial rivers must be respected as it acts as a trap for sediment and contaminants from the construction area.
- Remove only vegetation essential for construction and do not allow any disturbance to the adjoining natural vegetation cover.
- Ensure that measures are in place to control the flow of excess water so that it does not impact on the surface vegetation
- The accumulation of water on the surface should be prevented. The drainage of the surface should be done in such a way that storm water will be led away quickly and efficiently without any erosion taking place.
- Runoff from roads must be managed to avoid erosion and pollution problems
- Prevent storm water or contaminated water directly entering any watercourse.
- Install waste traps to catch litter conveyed by surface runoff.
- Dissipate concentrated storm water flows through energy dissipaters or vegetated areas.
- Repair all erosion damage as soon as possible. Do not allow erosion to develop on a large scale before effecting repairs.

5.3. The Operational Phase

Maintain the storm water management system for the facility on an ongoing basis and ensure that this is always in good working order. The following is of relevance:

- Protective buffers must be respected as it acts as a trap for sediment and contaminants.
- Ensure that measures are in place to control the flow of excess water so that it does not impact on the surface vegetation.
- The accumulation of water on the surface should be prevented. The drainage of the surface should be done in such a way that storm water will be led away quickly and efficiently without any erosion taking place.
- Runoff from roads must be managed to avoid erosion and pollution problems.
- Prevent storm water or contaminated water directly entering any watercourse.
- All waste traps within the storm water system will be emptied / cleaned regularly to ensure their efficient functioning.
- Dissipate concentrated storm water flows through energy dissipaters or vegetated areas.
- Repair all erosion damage as soon as possible. Do not allow erosion to develop on a large scale before effecting repairs.

REFERENCES

Environmental Best Practice Specifications: Construction for Construction Sites, Infrastructure Upgrades and Maintenance Works. Department of Water Affairs and Forestry, 2005.

DRAFT