

# MARSH

## Environmental Management Plan

### The Cullinan Estate

Situated on Portion 1 of the Farm Hartbeestfontein 484 JR Cullinan,  
Nokeng Tsa Taemane Local Municipality

**GDACE Ref: Gaut 002 / 07-08 / N0644**

**DRAFT**

**Submitted by: Marsh Environmental Services**

**To: Gauteng Department of Agriculture,  
Conservation and Environment**

**On behalf of: Eagle International Group Holdings (Pty) Ltd**

**August 2008**

## 1. BACKGROUND

Marsh Environmental Services (MES) as independent environmental consultants have been appointed by Eagle International Group Holdings (Pty) Ltd to facilitate the Integrated Environmental Management (IEM) procedure for the proposed development of the Cullinan Estate within the jurisdiction of the Nokeng Tsa Taemane Local Municipality, Gauteng.

In application for environmental authorization in terms of the National Environmental Management Act (Act 107 of 1998), the following listed activities are relevant:

- **GN R386 (Schedule 1), Activity no. 16 (b):**

The transformation of undeveloped, vacant or derelict land to establish residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.

- **GN R386 (Schedule 1), Activity no.18:**

The subdivision of portions of land 9 ha or larger into portions of 5 ha or less.

- **GN R387 (Schedule 2), Activity no. 2:**

Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

## 2. PURPOSE OF THE EMP

The purpose of the Environmental Management Plan is to mitigate the negative impacts and maximize positive impacts during the design, construction and operational phases of the proposed activity, as identified in the Environmental Impact Report. This EMP will be amended according to any conditions and specific requirements contained in the Record of Decision (RoD) issued by the decision making authority, namely the Gauteng Department of Agriculture, Conservation and Environment.

This EMP must be made binding on all contractors as it is understood that any development can pose various environmental and social risks which are site and neighbour specific. The risks should be taken into account during the planning phase of the development. The purpose of this EMP is to provide management responses that will ensure that the impacts of development activities are minimized for all phases.

This EMP is a standalone document, which must be used on the site during each phase of the development (planning, construction and operational). This document should be flexible so as to allow the contractor and Owner to conform to the management commitments without being prescriptive. If implemented consistently, the management commitments will ensure that the anticipated environmental risks are minimized. It is the responsibility of the applicant and associated contractors and subcontractors to comply with the requirements of this EMP. Any parties responsible for transgression of the underlying management measures outlined in this document will be held liable for non-compliances and will be dealt with accordingly.

This EMP addresses the following three phases of the development:

## 2.1 Planning Phase

Incorporating pro-active environmental management measures with the goal of attaining sustainable development can be achieved during this phase. Pro-active environmental measures minimize the chance of negative impacts occurring. Necessary corrective actions can be taken to further limit potential impacts.

## 2.2 The Construction Phase

The bulk of the impacts during this phase will have immediate effect (e.g. noise and dust pollution). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur.

## 2.3 The Operational Phase

By taking pro-active measures during the planning and construction phases, potential environmental impacts originating during the operational phase can be minimised.

## 3. KEY ISSUES

The key issues identified in the Environmental Impact Assessment process which affect the area of the development footprint, are illustrated in Figure 1.1, and include:

- The proximity to areas of high biodiversity sensitivity;
- The proximity to heritage sites;
- The proximity to arable soils.

Refer to Section 5.1 for specific mitigation measures proposed for the mitigation of these key issues.

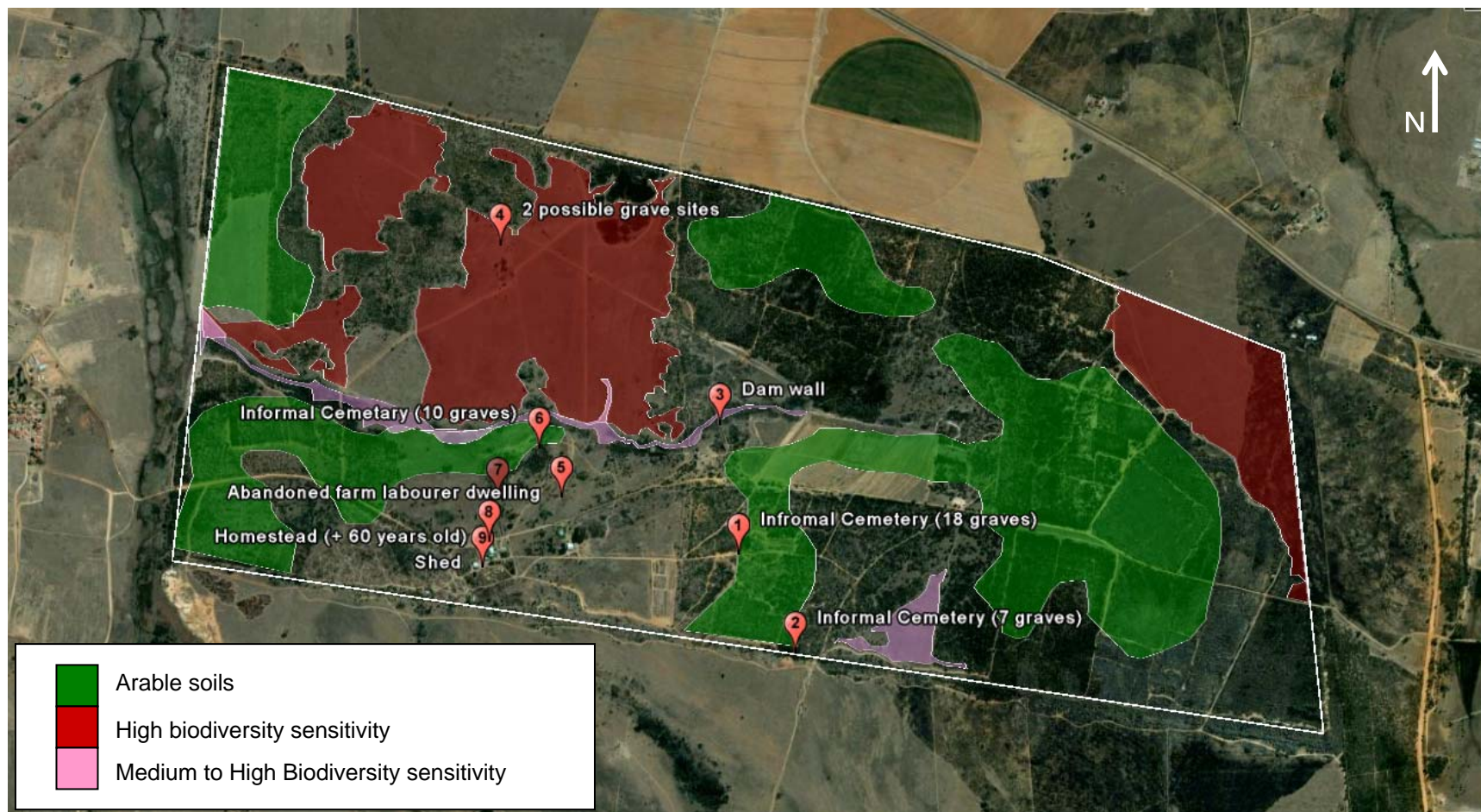


Figure 1.1: Overview of key risk areas identified in EIA

## 4. RESPONSIBILITIES

### 4.1 Environmental Authority

Authorization in the form of a Record of Decision (RoD) is required from GDACE based on information included in the EIA report. This EMP will reflect conditions and specific requirements contained in the RoD as appropriate. The duties of the GDACE may extend to site visits during construction and operational phases as deemed appropriate by the GDACE Environmental Management Inspectorate (EMI), and may oversee compliance with the RoD. Any significant deviation or amendment from the approved activities or layout plan requires authorization from GDACE.

### 4.2 Nokeng Tsa Taemane Local Municipality

The Nokeng Tsa Taemane Local Municipality remains responsible for the formal approval of the township. Internal services will be provided as dictated by the applicable standards and the Local Authority.

### 4.3 Applicant

The applicant remains responsible for ensuring that the development is implemented according to the requirements of the EMP. Although the owner appoints specific subcontractors to perform functions on his/her behalf, this responsibility is delegated. The owner is responsible for ensuring that sufficient resources (time, financial, human, equipment, etc.) are available to the other role players (e.g. the ECO, ELO and contractor) to efficiently perform their tasks in terms of the EMP. The owner is liable for restoring the environment in the event of negligence leading to damage to the environment.

The applicant must ensure that the EMP is included in the tender documentation so that the contractor who is appointed is bound to the conditions of the EMP. The owner must appoint an independent Environmental Control Officer (ECO) during the construction phase to oversee all the environmental aspects relating to the development.

### 4.4 Contractor

The contractor, as the applicants agent on site, is bound to the EMP conditions through his/her contract with the applicant, and is responsible for ensuring that he adheres to all the conditions

of the EMP. The contractor must thoroughly familiarise him/herself with the requirements of the EMP before construction and request clarification where unclear. The contractor must ensure that he/she has provided sufficient budget for complying with all EMP conditions at the tender stage. The contractor must comply with all orders (whether verbal or written) given by the ECO, project manager or site engineer in terms of the EMP.

#### 4.5 Environmental Officer (EO)

During the Construction Phase of the proposed development the principal contractor shall appoint an environmental officer (preferably a senior member of his staff) who will be responsible for overseeing compliance with the EMP.

- Oversee day-to-day compliance with the EMP by the contractor's staff and sub-contractors and their staff;
- Conduct weekly audits of all construction activities for compliance with the EMP, and make these audit reports available for viewing by the Environmental Consultant (EC) on request;
- Issue instructions to remediate non-compliance;
- Conduct regular inspection meeting with the EC to report on compliance, and
- Report non-compliance to the ECO.

#### 4.6 The Environmental Control Officer (ECO)

It is recommended that an independent Environmental Control Officer (ECO) be appointed by the applicant to oversee all the environmental aspects relating to this development. The ECO should be appointed during the planning phase and form part of the project team. He/she should attend relevant project meetings, conduct audits to assess compliance with the EMP and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO would be responsible for:

- Liaison with relevant authorities,
- Liaison with contractors regarding environmental management,
- Undertaking routine monitoring and appointing a competent person/institution to be responsible for specialist monitoring, if necessary.

##### 4.6.1 Liaison with Environmental Authority

The ECO would be responsible for liaising with GDACE. During the construction phase, the ECO would be responsible for submitting monthly Environmental Audit Reports on the development to GDACE. These audit reports will be based on the mitigating measures recommended and will include a description of the general state of the site, with specific reference to sensitive areas and areas of non-compliance. In order to keep a record of any impacts, an environmental log should be kept on a continual basis.

#### 4.6.2 Liaison with Contractors

The ECO will be responsible for informing the contractors of any decisions that are taken concerning the natural and social environment during the construction phase of the development. This would also include informing the contractors of the necessary corrective actions to be taken against employees transgressing the management activities stipulated in this EMP.

#### 4.7 Environmental Liaison Officer (ELO)

An Environmental Liaison Officer (ELO) must be appointed by the Contractor to assist with the more regular monitoring of the construction activities. Any issues raised by the ECO will be routed to the ELO for the Contractors' attention. The ELO shall be permanently on site to ensure daily environmental compliance with the EMP and would ideally also be a senior and respected member of the construction crew. Past experience has revealed that ELOs that can relate to the work force and are the most effective for information transfer and ensuring compliance with the EMP.

### 5. ENVIRONMENTAL MANAGEMENT PLAN

The following section forms the core of this EMP for the planning, construction and operational phases of this development. This information should be used as a checklist on site during each phase of the development. Compliance with this EMP must be audited monthly during the construction phase and once immediately following completion of construction.

## 5.1 Site specific mitigation measures

### 5.1.1 Timber

1. Trees to be kept for purposes of visual screening and stormwater attenuation on the periphery of the development footprint should be clearly marked before commencement of construction.
2. Where feasible, raw timber within the development footprint should be introduced into the construction process of the proposed development; construction techniques such as wattle and daub can be investigated.
3. Where timber products cannot be used in the construction process, it is advised that the applicant consult wood processing businesses with the aim of beneficiating the raw product for resale. This consultation process should serve to benefit local businesses in the absence of other feasible market options identified by the applicant.

### 5.1.2 Construction & Construction Footprint

1. Design and construction of the development should be limited to areas of medium to low significance as far as possible. The development footprint shall not encroach onto areas of high significance.
2. The removal of existing vegetation shall be phased in order to reduce the denuded surface area. This will ensure that erosion of soil is minimised.
3. Sensitive areas shall be cordoned off by means of hazard tape or temporary fencing restricting access to construction staff.
4. The contractors camp and all associated construction equipment shall be stored located as far as possible from areas ascribed to have a high sensitivity, including the stream.
5. Floral and faunal specialists should be consulted should Red Data species be identified during construction.
6. Limit disturbance to the movements of any animals intending to flee the impacted area;
7. Prohibit the intentional killing of animals through on-site supervision by an Environmental Officer (EO).
8. Relocate, with the assistance of an appointed environmental officer and an ecologist, any animals found during ground-breaking.
9. Avoid construction during spring as all animals reproduce and disperse during this time.
10. No construction related activities shall occur within a minimum of 32m from the banks of the non-perennial stream. Only landscaping activities specific to the restoration and re-vegetation to a more natural state shall be permitted.

11. Sourcing of workers/labourers from the general area should be maximised, at a central point away from the development site in order to deter loitering and mitigate the incidence of crime.

#### 5.1.3 Top soil conservation

1. The arable topsoil layer shall be stored in bunded areas for reintegration into the development.
2. Preventative measures for wind and dust pollution shall be taken.
3. Reapplication of soil to denuded areas upon completion of construction activities shall be undertaken.

#### 5.1.4 Heritage sites

1. Where identified heritage sites can be integrated into the development, it is advised that these be fenced off and improved. In this case the body corporate shall have full responsibility for maintaining these sites.
2. Where heritage sites cannot be incorporated into the developable area and the destruction of such sites is required, a heritage consultant must be consulted to undertake the necessary procedures as required by the National Heritage Resources Act 25 of 1999.

#### 5.1.5 Sewage treatment

1. The package plant shall be located in a non-sensitive environment away from residential units and as far away from the stream as possible (a minimum of 32m)
2. It must be recorded in the constitution/homeowners agreement that a body corporate is responsible for the maintenance and functioning of the package plant.
3. All residents must be informed that return water from the package plant is for irrigation purposes only.

#### 5.1.6 Access and traffic

1. No construction vehicle access must be allowed to occur from the west (via Zonderwater), thereby eliminating any destruction or impact on the major wetland system. All access shall occur from the east of the site.
2. The intersection of the R515 and the R513 must be signalised with additional short right turning lanes on each approach in order to improve its capacity and accommodate increased traffic.

3. Introduction of a traffic circle at the intersection of the R513 with the Hartbeesfontein/Zonkolol Road (Rd 495) in order to improve vehicle operating conditions is advised.
4. Existing tracks and roads within the site should be utilised as far as possible for internal road and track reticulation, especially in areas identified to be highly sensitive.

#### 5.1.7 Rehabilitation

1. Only landscaping activities specific to the restoration and re-vegetation to a more natural state of the drainage line shall be permitted.
2. Where possible, the applicant or Section 21 Company should undertake to rehabilitate the wetland during the operational phase with the assistance of a qualified ecologist, i.e. removal of plantations/alien infestations that currently have transformed the wetland. This will attract a higher diversity of indigenous fauna and add value to the development.

#### 5.1.8 Fencing and perimeter

1. No solid perimeter walls should be constructed around the development. Use should be made of palisade fencing in order to allow for the movement of indigenous fauna.
2. It is proposed that a screen of existing vegetation be retained on the periphery of the site in order to minimise the visual impact of the proposed development on adjacent areas, most notably from the R513.

### 5.2 General mitigation measures

In addition to the proposed site specific mitigation measures proposed, the following general mitigation measures should be implemented and audited in accordance with this EMP, during the planning, construction and operational phases.

Planning Phase  
The Cullinan Estate

#	Activity & Action – Planning Phase	Responsibility	Frequency of Action
<b>1</b>	<b>General</b>		
1	This EMP must be made binding to the main contractor as well as individual sub-contractors and should be included in the tender documentation of the construction contract.	Owner, ECO	Once-off
2	This EMP does not absolve the owner from complying with any other relevant legislation.		Continuous
3	Approval must be obtained from DWAF for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No 36 of 1998).	Owner, Contractor	Once-off
4	The Owner must appoint an independent Environmental Control Officer (ECO) who must monitor the contractor's compliance with the Environmental Management Plan for the duration of the construction period. The Owner must provide the contractor with a copy of the EMP.	Owner	Once-off
5	The priority of the ECO is to maintain the integrity of the development conditions outlined in the EMP. The ECO must form part of the project management team and attend all project meeting or as required.	ECO	Continuous
6	The contractor must ensure that the construction crew attend an environmental briefing and training session presented by the ECO prior to commencing activities on site.	Contractor, ECO	Once-off
<b>2</b>	<b>Appointment and Duties</b>		
1	The contractor must appoint an Environmental Liaison Officer (ELO). This person will be required to monitor the situation with a direct hands-on approach, and ensure compliance and co-operation of all personnel.	Contractor	Once-off
<b>3</b>	<b>Erosion/ Siltation</b>		
1	Construction should take place during the dry season if possible. Failing this, additional measures should	Contractor, ECO	Once off

#	Activity & Action – Planning Phase	Responsibility	Frequency of Action
	be taken to ensure that possible environmental damage is minimised.		
2	In the event of erosion occurring, the contractor must affect repairs timeously. Restorative repairs should include the backfilling and consolidation of eroded areas.		As necessary
3	All construction activities must remain within the boundaries of the development area, as demarcated at the start of construction.		Continuous
4	Keep the size of the area of the construction footprint to a minimum by constructing boundaries and demarcated areas thus reducing the area infringement of the development on the natural habitat.	Contractor, ECO	Continuous
5	Existing roads and services must be utilised as far as possible thus reducing the area infringement of the development on the natural habitat.		
<b>4</b>	<b>Impact on sensitive natural habitat</b>		
1	The extent of the construction site should be demarcated on site layout plans, and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated developmental area should be considered as “no-go” areas for employees, machinery or even visitors.	Owner	Once Off
2	Keep the size of the area of the construction footprint to a minimum by constructing boundaries and demarcated areas thus reducing the area infringement of the development on the natural habitat.	Owner, Contractor	Continuous
<b>5</b>	<b>Construction generated waste</b>		
1	All contracts with subcontractors should contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP.	Contractor, ELO	Once-off
<b>6</b>	<b>Storm water</b>		
1	Storm water on the site must be managed, including measures to ensure that the energy of storm water that is to be released into the drainage areas is dissipated. Measures must be implemented to distribute storm water as evenly as possible to avoid point sources of erosion.	Design Engineer	Once off

#	Activity & Action – Planning Phase	Responsibility	Frequency of Action
<b>7</b>	<b>Visual and Aesthetic Impact</b>		
1	Minimising disturbance to plants and provision of ongoing protection.	Owner, Town Planner	Once-off
<b>8</b>	<b>Traffic impact</b>		
1	Pro-active planning with reference to the undertaking of the construction activities outside peak hours will mitigate against the potential traffic congestion that could result since most traffic is encountered in the early mornings and late afternoons (peak hours).	Contractor	Once off or as necessary
<b>9</b>	<b>Safety and Health</b>		
1	The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the National building regulations Contractor Daily	Contractor	Monitor daily
<b>10</b>	<b>Security</b>		
1	The project programme and phases as well as contact details and responsible individuals should be available to surrounding residents, at all times during construction.	Contractor	Monitor daily
2	The contractor must supply his own security arrangements for the construction area. No construction workers are allowed on site after hours, except for a designated security officer.		
<b>11</b>	<b>Social/ Existing Services</b>		
1	All agreement made with the Nokeng Tsa Taemane Local Municipality need to be adhered to. All necessary approvals need to be obtained before commencement of construction.	Contractor, Engineer	As necessary
2	Employment of local labour, from the surrounding communities and the implementation of training is to be instituted during the time period of the project.		
<b>12</b>	<b>Public Participation and Labour</b>		
1	It is recommended that the CLO should be a member of the community affected by the project	Owner, Contractor	At project initiation, and as necessary.
2	Residents within the vicinity of the project will be informed and kept informed of any construction dates. The working area of the construction site shall be agreed on between the Consulting Engineer, ECO and		

#	Activity & Action – Planning Phase	Responsibility	Frequency of Action
	the Contractor.		
<b>13</b>	<b>Environmental impacts of site establishment</b>		
1	<p>Prior to establishment of the work area, the Contractor shall produce a site establishment plan showing the positions of the following for approval by the ECO:</p> <ul style="list-style-type: none"> <li>▪ All construction material and equipment lay-down yards;</li> <li>▪ Temporary ablution areas;</li> <li>▪ Refuse and kitchen areas;</li> <li>▪ Spoil sites; and</li> <li>▪ Temporary stockpiles sites for topsoil intended for reuse.</li> </ul>	Contractor, ECO	At project initiation and as work progresses, as necessary
<b>14</b>	<b>Environmental incidents</b>		
1	The contractor must take corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves.	ELO, ECO, Contractor	Continuous
2	Any non-compliance with any of the measures stipulated in this EMP must result in the penalties being issued to the transgressor. This must be included in the contract for any construction work.	Owner	
<b>15</b>	<b>Emergency Preparedness</b>		
1	If chemicals in sufficient quantity and toxicity have the potential to be released into any watercourse, emergency contingency plans should be prepared as safety measures. These safety measures should be communicated with the relevant personnel on the construction site.	Design Engineer, Owner, ECO	Once-off

Construction Phase

The Cullinan Estate

#	Activity & Action – Construction Phase	Responsibility	Frequency
<b>1</b>	<b>General</b>		
1	General good-construction and best industry practices should be employed to avoid adverse environmental impacts.	Contractor, ELO	Monitor daily or as necessary
2	All persons employed by the contractors and sub-contractors shall abide by the requirements of the general environmental protection specifications.		
3	The onus is on the contractor to ensure that the workforce is aware of and conforms to the environmental guidelines that are applicable to the project.		
4	Construction equipment may not move outside the area defined as the site.		
5	Labour should be recruited from the local communities, where practicable.		
6	The labour force should be trained in the necessary skills for the project, if necessary.		
7	On Completion of Works, the Contractor shall clear away and remove from the site all construction paint, surplus materials, foundations, plumbing and other fixtures, rubbish and temporary works of every kind. Areas thus cleared shall be graded and scarified to restore the ground to its original profile as near as practicable before topsoil placement.	Contractor, ECO	Continuous
8	All persons employed by the Contractor or his subcontractors shall abide by the requirements of these General Environmental Protection Specifications.		
9	Any employees of the Contractor or his subcontractors found to be in breach of any of the General Environmental Protection Specifications may be ordered by the ECO to leave the site forthwith. The order may be given verbal or in writing. Confirmation of a verbal order will be given as soon as practicable but lack of confirmation in writing shall not be a cause for the offender to remain on site. No extension of time will be granted for any delay or impediment to the Contractor brought about by a person ordered to leave the site.		
10	Staying overnight on the campsite must be prohibited for all construction staff, apart from the on-site security. Mitigation measures as detailed in the section below are applicable to members of the workforce of the appointed contractors that stay overnight.		

#	Activity & Action – Construction Phase	Responsibility	Frequency
11	Only a single access road should be used to the construction area, and the movement of construction vehicles at the construction site should be limited to a specific area.	Contractor, ECO	Once Off
<b>2</b>	<b>Site establishment</b>		
1	Vegetation and trees to be retained shall not be damaged or felled	Contractor, ECO	Once Off
2	To eliminate vegetation destruction, the main construction area must be placed in an area that is already disturbed and not sensitive and at least 100 m from any stream or wetland.	Contractor, ELO, ECO	Monitor weekly
3	Care should be taken to adequately drain areas surrounding water points in order to avoid the development of pools of standing water, as tend to be a breeding source of flies, mosquitoes and other vectors.		
4	To minimise run-off, which can cause erosion and pollution down slope, these sites should not be placed on sloped areas.		
5	Provision for the removal of waste generated by the workers accommodation as well as by the workshop, shall be made.		
6	Sufficient rubbish disposal units should be made available for waste disposal.		
7	Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractors camps.	ELO	As necessary
8	Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air.	Contractor, ELO	Daily
9	On completion of the works, the Contractor shall clear away and remove from the site all surplus materials and other fixtures, rubbish and temporary works of every kind.	Contractor, ECO	Site decommissioning
<b>3</b>	<b>“No-go areas” and the construction footprint</b>		
1	No-go areas must be demarcated with fencing, warning tape and signs before any construction activities or site preparation activities commence. These areas and the type of fencing/barrier must be approved by the ECO.	Contractor, Owner, ECO	Once off, Monitor
2	Absolutely no land clearing, construction activities, vehicular traffic of any kind, pedestrian traffic, fires and any associated activity may occur beyond these demarcated areas. Very strict control must be		

#	Activity & Action – Construction Phase	Responsibility	Frequency
	exercised over this aspect of construction activities.		
3	Access roads must also be clearly demarcated so to stop construction vehicles taking unnecessary shortcuts, thereby expanding the construction footprint.		
4	The breaking of trees for fires is strictly prohibited. The contractor must supply all necessary firewood.		
<b>4</b>	<b>Provision of Water</b>		
1	Potable water should be supplied.	Contractor, ELO	As necessary
2	Great care is to be taken that the water supply is not contaminated in any way.	Contractor, ELO, ECO	Once-off
<b>5</b>	<b>Toilet Facilities and Waste Water</b>		
1	Adequate ablutions are to be supplied for workers.	Contractor, ELO, ECO	Monitor weekly
2	Safe and effective sewage treatment will require one of the following sewage handling methods (i.e. dry composting toilets such as 'enviro loos', or portable chemical toilets, which are supplied and maintained by the site contractor). For this project, chemical toilets are the preferred method of treating and handling sewage.		
3	Under no circumstances may ablutions occur outside of the provided facilities.		
4	Chemical toilets should be emptied regularly and the site contractor should supply toilet paper.		
5	Chemical toilets should be placed within easy access of the workforce, to ensure that the surrounding environment is not used for this purpose.		
6	Chemical toilets should be placed and anchored so that they do not blow over.		
7	Placement of chemical toilets should avoid the possibility of the area surrounding the toilet becoming flooded.		
<b>6</b>	<b>Solid Waste Control and Litter</b>		
1	No littering by construction workers may be permitted. Any litter will be collected and removed off-site to a registered waste site.	ELO	Monitor weekly
2	A weekly litter patrol of the entire site is to be conducted by the ELO. The necessary remedial action is to take place within 24-hours of the inspection by the upgrading crew.		

#	Activity & Action – Construction Phase	Responsibility	Frequency
3	Rubble and litter must be removed once a week or more often as the need arises from all areas of the construction site and disposed of at an approved dumping site as approved by the Council.	ELO, construction crew	As necessary
4	Sufficient containers must be on the construction site to handle the amount of litter, wastes and rubbish debris and builders wastes generated on the site.		
5	Containers must be securely covered at all times and emptied frequently to avoid rodents, insects or any other organisms accumulating on the site and becoming a health hazard to surrounding habitats or adjacent properties.		
6	No rubble or discarded building materials must remain on the construction site for more than two weeks.	Contractor, ELO	Monitor daily
7	All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site.	Contractor, ELO	As required
8	Burning of waste is not allowed		
9	All refuse containers are to be covered at all times.	Contractor, ELO	Daily
10	The Contractor shall remove all waste and transport all such waste material off site to registered dump areas, which have been approved by the Consulting Engineer or ECO.	Contractor, ECO	Weekly
11	Should spoil sites be required, the locality, intended operation, maintenance and future rehabilitation methods for the spoil sites <b>Spoil Sites</b> must be approved by the resident engineer and the ECO any relevant landowner. Spoil sites may not be used for the disposal of hazardous or toxic waste.	Contractor, ECO, Resident Engineer	As necessary
<b>7</b>	<b>Construction Material Storage</b>		
1	A suitable and safe area for storage of the construction material is to be provided.	Contractor, ECO	As necessary
<b>8</b>	<b>Concrete and Chemicals</b>		
1	Concrete shall be mixed only in areas, which have been specially demarcated for this purpose and on mortar boards.	Contractor, ELO, ECO	Monitor weekly Continuous,
2	Concrete and plaster mixing should take place in a designated area. This designated area should be bermed to prevent run-off from this area and in an area beyond the 1:100 flood line.		
3	All concrete that is spilled outside these areas shall be promptly removed by the Contractor and taken to		

#	Activity & Action – Construction Phase	Responsibility	Frequency
	an approved dumpsite. Any spillage, which may occur, will be investigated and immediate remedial action shall be taken.		
4	Cleaning of cement mixing and handling equipment shall be done using proper cleaning trays, so as to avoid contamination of soils and groundwater.		
5	All empty containers shall be removed from the site for appropriate disposal at a licensed commercial facility. Absolutely no refuse shall be burnt on site.		
6	After all concrete mixing is complete; all waste concrete shall be removed from the batching area and disposed of at an approved dumpsite.		
7	Storm water shall not be allowed to flow through the batching area. All effluent water from the camp washing facility shall be disposed of in a properly constructed French drain, situated as far as possible, but not less than 100 meters, from a stream, river pan, dam or borehole.		
<b>9</b>	<b>Fuel and chemical management</b>		
1	Storage of potentially hazardous materials must be agreed with the ECO. These materials include fuel, oil, cement, bitumen etc.		
2	As a minimum, a walled concrete-platform, dedicated store with adequate flooring or lined bermed area must be used to store chemicals in their containers such as fuel, oil, paint, bitumen, herbicide and insecticides, as appropriate, to minimise infiltration of said chemicals into the soil.		
3	Fuel should be stored and maintained in a steel tank, supplied by the fuel suppliers. The fuel tanks shall be contained within a berm constructed of bricks and mortar, concrete or other appropriate impermeable material.		
4	The volume of the bermed area shall be of sufficient capacity to contain the full volume plus half of the fuel tanks in the event of spill.		
5	Drip trays (minimum of 10cm deep) are to be placed under all vehicles if they stand for more than two days.		
6	The surface area of the drip trays will be dependant on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.		

#	Activity & Action – Construction Phase	Responsibility	Frequency
7	The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle.		
8	Sufficient care must be taken when handling these materials to prevent pollution by spillage.		
9	Surface water draining off contaminated areas containing oil and petrol are to be channelled into a sump.	Contractor, ELO	As necessary, monitor weekly
10	Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site.	Contractor	Continuous
11	Soil contaminated by oil or other hazardous substances should be disposed of, at an approved waste dumpsite.		
12	The Contractor shall educate workers on the proper method for cleaning fuel points so as to minimise fuel or oil being washed out of the demarcated areas.		
<b>10</b>	<b>Landscaping</b>		
1	All areas affected by the construction works will need to be rehabilitated and re-vegetated. This includes temporary access roads, construction sites, workers sites, lay-down areas, etc.	Contractor, ECO	As necessary
2	Areas that require additional topsoil and seeding due to insufficient topsoil being stockpiled or due to contamination shall be re-instated at no additional cost to the Owner by the Contractor on instruction from the Consulting Engineer or Environmental Control Officer.	Contractor	As necessary
<b>11</b>	<b>Erosion/ Siltation</b>		
1	Construction should take place during the dry season if possible. Failing this, additional measures should be taken to ensure that possible environmental damage is minimised.	Contractor, ECO	Once off
2	In the event of erosion occurring, the contractor must affect repairs timeously. Restorative repairs should include the backfilling and consolidation of eroded areas.		As necessary
3	No stockpiles or construction materials may be stored or placed within any drainage line on site or in close proximity to storm water drains. The temporary storage of topsoil, inert spoil, fill etc. should be above the 20 year flood line or at least 20 m from the top of the bank of any drainage lines, whichever is the maximum or as agreed with the ECO.		Once-off, monitor

#	Activity & Action – Construction Phase	Responsibility	Frequency
4	To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.		As necessary
5	Stockpiles should not be higher than 2m to avoid compaction, and single handling is recommended.		
6	The energy/ velocity of storm water run off should be dissipated by use of metre drains at appropriate intervals.		
7	All trenches and excavation works must be properly backfilled and compacted according to specifications given in sub-clause 5.2.4. of SABS 1200DA.	Contractor, ELO	
8	Where it is necessary to clear large areas, the clearing activities must be followed by the planting of grass, within two weeks.	Owner, Contractor, ECO,	As necessary
<b>12</b>	<b>Destruction of vegetation</b>		
1	Clearance of indigenous vegetation must be kept to a minimum.	Contractor	Continuous
2	No indigenous vegetation may be collected, or used for firewood. Contractor, ECO	Contractor, ECO	As required
3	The access to the construction site should occur on disturbed areas or on existing roads.	Contractor, ECO	As required
4	Any disturbance of the environment such as areas designated for the storage of bricks, mixing of concrete or collection of rubble must be restricted within this footprint and must be demarcated with warning tape so as no disturbance of any kind can occur outside of this area.	Contractor, ELO, Owner	Monitor daily
5	It is essential to implement a rehabilitation plan on cleared areas.		Once off
<b>13</b>	<b>Impact on animal life</b>		
1	Under no circumstances shall any animals (wildlife and domestic animals) be handled, removed, killed or interfered with by the contractor, his employees, his sub-contractor or his employees.	Contractor, ECO	As necessary
2	The Contractor shall advise his workers of the penalties associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act 71 of 1962) sec. 2 (fine R2 000 and/or 12 months imprisonment).		Once off
3	All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it should be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with	Contractor, ELO	Once off

#	Activity & Action – Construction Phase	Responsibility	Frequency
	fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake a specialist should be called in to safely relocate the animal.		
4	The construction site must be kept clean and tidy and free from rubbish, which would attract animal pest species and increase degradation of surrounding faunal habitat.	Contractor	Once-off
<b>14</b>	<b>Surface water management</b>		
1	The Contractor shall not use the land forming the site of, or connected with, the works for any purpose whatsoever other than for the proper carrying out of the works under the Contract and shall place any camps that may be required for himself and his employees only on sites approved by the ECO and consulting engineer.	Contractor, ELO	Monitor daily or as necessary
2	No uncontrolled discharges from the site/working area to the watercourse shall be permitted. All discharge points will require approval. Discharges include concrete mixing, vehicle washing, etc.		
3	At all times care should be taken not to contaminate surface water resources.		
4	Should water downstream of a spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the engineer. If liability is found to rest with the contractor, the costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input.		
<b>15</b>	<b>Groundwater Contamination</b>		
1	Chemical toilets must be installed on site throughout the duration of the construction phase. They should be installed and cleaned once every two weeks by a recognised temporary sanitation company.	ECO, Contractor,	Once-off, Monitor bimonthly
2	Underground services should be designed in such a way so as to require minimum maintenance that would disturb the subsurface environment.	Owner, Landscape Contractor	Once-off
3	A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. Sufficient care must be taken when handling these materials to prevent pollution.	Contractor, ECO	Once – off/ as necessary
4	All construction materials liable to spillage are to be stored in appropriate structures with impermeable		

#	Activity & Action – Construction Phase	Responsibility	Frequency
	flooring.		
5	Concrete is to be mixed on mixing trays only, not on exposed soil.	Contractor, ELO	Continuous
6	Concrete and tar shall be mixed only in areas, which have been specially demarcated for this purpose.		
7	All concrete and tar that is spilled outside these areas shall be promptly removed by the Contractor and taken to an approved dumpsite.		
8	After all the concrete / tar mixing is complete all waste concrete / tar shall be removed from the batching area and disposed of at an approved dumpsite.		
9	In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately.	Owner, ECO	As necessary
<b>16</b>	<b>Access Roads</b>		
1	Existing roads shall be used as far as possible. Necessary traffic control measures should be instituted especially on high volume roads. The Consulting Engineer in consultation with the ECO shall approve new, temporary and/or access roads. No deviation from approved access roads shall be allowed.	Contractor, Engineer, ECO	As necessary
<b>17</b>	<b>Noise Pollution</b>		
1	Noise levels shall be kept within acceptable limits, and construction crew must abide by local by-laws regarding noise.	Contractor, ELO, ECO	Once-off
2	Where possible construction work should be undertaken during normal working hours (08H00 –17H00), from Monday to Friday. If necessary special permission can be granted to continue work on Saturdays from 08H00 to 13H00; No work will be allowed on Sundays and Public Holidays.	Contractor, ELO	Continuous
3	The construction crew must abide by the National Noise laws and the local by-laws regarding noise.	Contractor	As necessary
4	Should an extension of the upgrading hours be required, the adjacent property owners are to be consulted and informed in writing two days in advance of any overtime activities.		
<b>18</b>	<b>Air Pollution</b>		
1	Water is to be used to dampen surfaces and curb dust production should the need arise.	ELO, Contractor	Monitor daily
2	Vehicles to be used during the construction phase are to be kept in good working condition and should not be the source of excessive fumes.		

#	Activity & Action – Construction Phase	Responsibility	Frequency
3	All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials.		Spot checks daily – weekly
<b>19</b>	<b>Traffic</b>		
1	Existing access routes should not be blocked or impeded by construction. If this is unavoidable, adequate prior planning should be implemented to ensure that safety and access to routes is maintained.	Contractor	As necessary
2	Allow for earthmoving vehicles and machinery to access the site outside of peak hours (09h00 – 15h30), if possible.		
3	Minimise the impact on existing traffic flow as far as possible.		
4	Roads should be kept free of construction debris. Debris, created as a result of construction, should be cleared timeously.		Monitor daily
<b>20</b>	<b>Heritage resources</b>		
1	Should any archaeological artefact be exposed during excavation, the construction in the vicinity of the findings must be stopped. Under no circumstances shall any artifact be destroyed. Such an archaeological site must be marked and fenced off, and the South African Heritage Resources Agency (SAHRA) must be contacted immediately.	Contractor	As necessary
2	Construction personnel must be alert and must inform the Local Council should they come across potentially valuable heritage findings.		
<b>21</b>	<b>Crime, safety, and security</b>		
1	The implementation of adequate and appropriate fencing and/or barriers between the site and adjoining properties and developments must be undertaken, to ensure sensitivity to adjoining residents and their properties, particularly during construction phases. The fences, once erected have to be checked and maintained.	Owner, contractor	Once off
2	The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the National Building Regulations.	Contractor, ELO	Daily
3	Ensure that the handling of equipment and materials is supervised and adequately instructed.		

#	Activity & Action – Construction Phase	Responsibility	Frequency
4	Limit access to the construction crew camp only to the workforce. The workforce should wear uniforms or other identification marking so as to be easily identifiable from members of the general public throughout the construction phase.		
5	The contractor must supply his own security arrangements for the construction camp. Contractor, ELO Once off		
<b>22</b>	<b>Social / Services</b>		
1	Labour employed must include members of the local community in order to reduce loitering at entrances to the development.	Contractor Once-off,	As required
2	All agreement made with the Water and Sanitation Division, as well as the electrical Division of the Nokeng Tsa Taemane Local Municipality need to be adhered to Contractor,	Engineer	As necessary
3	The Owner must ensure that opportunities will be given to Social/ Existing local contractors.		
4	Woman must have equal employment opportunities. Salaries of woman must be equal to that of a man doing the same job.	Owner, contractor	Once-off
<b>23</b>	<b>Rehabilitation</b>		
1	All topsoil must be appropriately stockpiled and conserved during the construction phase. The topsoil should be inverted when stockpiled to promote the decay of invader/weed species seed.	ECO, Contractor	Monitor daily
2	Rehabilitation must include a heterogeneous mixture of native indigenous species, rather than a monospecific approach. Rehabilitation effort should be directed towards the promotion of a system approach (be functional) rather than a compositional approach.		
<b>24</b>	<b>Record Keeping</b>		
1	The Engineer and ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and shall issue to the contractor a notice of non-compliance whenever transgressions are observed	ECO, Engineer Continuous,	Report monthly or as necessary
2	The non-conformance and remedial action shall be documented and reported by the ECO on the incidence log to the engineer in a monthly report.		
3	Repeated non-compliance, after notice has been issued, and sufficient time has been allowed for		

#	Activity & Action – Construction Phase	Responsibility	Frequency
	remedial action, shall be reported to GDACE for review.		
<b>25</b>	<b>Emergencies</b>		
1	Emergency procedures must be produced and communicated to all the employees on site. This will ensure that accidents are responded to appropriately and the impacts thereof are minimised. This will also ensure that potential liabilities and damage to life and the environment are avoided.	Owner, contractor	Once off
2	The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.	Owner, contractor, ELO	Once off
3	The contractor must have a basic spill control kit available at each construction crew camp and around the construction site. The spill control kits must include absorptive material that can handle all forms of hydrocarbon as well as floating blankets / pillows that can be placed on water courses. The contractor shall ensure that at least the site foreman and ELO have received formal training in the use of the spill control kit.	Owner, contractor, ELO, site foreman	Once off

Operational Phase

The Cullinan Estate

Activity & Action – Operational Phase	Responsibility	Frequency of Action
<b>Site management</b>		
Management and task groups needs to be established to monitor, manage and maintain the following: <ul style="list-style-type: none"> <li>▪ Services; and</li> <li>▪ Crime, safety and security.</li> </ul>	Body corporate	Continuous
A company registered in terms of Section 21 of the Companies Act shall have the full responsibility for the maintenance of the natural environment and should therefore take the operational aspects of the development into consideration	Body corporate	Continuous
It must be recorded within the constitution/homeowners agreement that all units should landscape utilizing indigenous flora (native to the area).	Owner	Once off
Educate home owners to minimise disturbance of and accidental or intentional killing of animals.	Body corporate	Continuous
Limited access to the rocky grassland areas should be provided during the operational phase of the development, to include passive recreation only.	Body corporate	Continuous
Passive recreation activities including hiking, cycling, horse riding and bird watching is permitted in all areas of the proposed development. All vehicles including recreational vehicles shall be restricted to designated roads or tracks designated as such.	Body corporate	Continuous
All households of the estate should be required to participate in a recycling scheme as founded by the body corporate or management of the estate.	Body corporate	Continuous
A maintenance plan for the property must be developed with regard to maintaining buildings, perimeter fencing, etc. in order to ensure that they do not deteriorate and become aesthetically unpleasant.	Owner	Once-off

Erosion, sedimentation and flooding		
The site should continually be monitored for the onset of erosion.	Owner	Continuous
Erosion preventative measures should be implemented upon the onset of erosion.		
Erosion of road verges and open spaces should be monitored and remediated as soon as possible.		
Storm water from the surrounding area should be released in a controlled manner from various points.		As required

## 6. CONCLUSION

Provided that mitigation measures are implemented according to this EMP, the project will result in limited negative environmental impacts. Furthermore, this EMP should be seen as a dynamic management tool, subject to review and modification during the project life cycle.

## 7. RECOMMENDATIONS

This Environmental Management Plan (EMP) should be used as an on-site reference document during all phases of this development, and auditing should take place in order to determine compliance with this EMP. Parties transgressing from this EMP should be held responsible for any rehabilitation procedures and costs. Penalties should be enforced upon those inflicting environmental degradation.