Appendix A

Alien Invasive Management
Sub-Plan
DRENNAN SOLAR ENERGY FACILITY

ALIEN INVASIVE PLANT MANAGEMENT PLAN

PRODUCED FOR ERM
ON BEHALF OF SOLAIREDIRECT
BY

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JUNE 2013
ALIEN MANAGEMENT PLAN OBJECTIVE

The purpose of the Drennan Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Drennan Solar Energy Facility. The broad objectives of the plan includes the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Promote the natural re-establishment and planting of indigenous species

PROBLEM BACKGROUND & LEGISLATIVE BACKGROUND

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that landusers clear Declared Weeds from their properties and prevent the spread of Declared Invader Plants on their properties.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- **Category 1** - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.

- **Category 2** – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a landuser must obtain a water use licence as these plants consume large quantities of water.

- **Category 3** – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species:

ALIEN SPECIES PRESENCE & ABUNDANCE AT DRENNAN

The Drennan site is currently lightly invaded by alien species. The density of alien species within the intact vegetation is generally low and is restricted to species such as *Opuntia ficus-indica* and *Opuntica aurantica*. Within disturbed areas such as along roadides and near watering points other species such as *Argemone ochroleuca*, *Conyza bonariensis*, *Salsola kali*, *Xanthium spinosum*, *Bidens pilosa*, *Cirsium vulgare* and *Tagetes minuta* were observed. These species generally do not invade intact veld, but quickly invade disturbed areas and as they are already present in the area, would increase rapidly at the site following construction activities. The *Opuntia* species are illustrated below and additional information on these as well as the other alien species including photographs can be found on the following website: [http://www.invasives.org.za/invasive-plants.html](http://www.invasives.org.za/invasive-plants.html)

![Opuntia ficus-indica](image1.jpg)

Opuntia ficus-indica

![Opuntia aurantica](image2.jpg)

Opuntia aurantica

ACTIVITIES LIKELY TO IMPACT ALIEN SPECIES ABUNDANCE

Alien species are adept at taking advantage of disturbance. The weedy and annual species listed above will take advantage of any disturbance at the site. The site is also in close proximity to several sources of alien species, including the railway line which has abundant alien species along the track as well as the areas of intensive agriculture along the Fish River. As a result any activities which result in the loss of plant cover or the disturbance of the soil surface will stimulate the invasion of alien species. This
includes clearing for roads, panels arrays, substations and any other infrastructure. Within the context of the site, areas which receive runoff and those areas of disturbed soil which are not rehabilitated are likely to be most vulnerable to alien invasion, in the short term as well as during the operation phase of the development. As runoff can create erosion and disturbance, it is also likely that poor runoff management at the site will promote the invasion of alien species.

**GENERAL CLEARING & GUIDING PRINCIPLES**

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area.
- The lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won’t increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses. The current site is relatively small and therefore seed input from adjacent already disturbed areas is likely to be the major source of alien species at the site. Therefore for effective control, a larger area than the site may need to be cleared.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

**CLEARING METHODS**

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.
- Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. [http://www.dwaf.gov.za/wfw/Control/](http://www.dwaf.gov.za/wfw/Control/)
- The *Opuntia* species at the site are likely to pose the greatest control problem as these species reproduce vegetatively as well as from seed. Therefore plants must be removed from the site and burned or controlled with herbicides which are not always effective.
USE OF HERBICIDES FOR ALIEN CONTROL

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which resprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

*Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.*

ALIEN PLANT MANAGEMENT PLAN

CONSTRUCTION PHASE ACTIVITIES

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

<table>
<thead>
<tr>
<th>Action</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ECO is to provide permission prior to any vegetation being cleared for development.</td>
<td>Daily</td>
</tr>
<tr>
<td>Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.</td>
<td>Weekly</td>
</tr>
<tr>
<td>Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute</td>
<td>Weekly</td>
</tr>
</tbody>
</table>
(Soil Saver) may be pegged over the soil to stabilise it.

Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.

Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.

Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.

Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.

Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.

The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.

Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.

Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.

Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.

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**MONITORING – CONSTRUCTION PHASE**

The following monitoring actions should be implemented during the construction phase of the development.

<table>
<thead>
<tr>
<th>Monitoring Action</th>
<th>Indicator</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document alien species present at the site</td>
<td>List of alien species</td>
<td>Preconstruction</td>
</tr>
<tr>
<td>Document alien plant distribution</td>
<td>Alien plant distribution map within priority areas</td>
<td>3 Monthly</td>
</tr>
<tr>
<td>Document &amp; record alien control</td>
<td>Record of clearing activities</td>
<td>3 Monthly</td>
</tr>
</tbody>
</table>
OPERATIONAL PHASE ACTIVITIES

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

<table>
<thead>
<tr>
<th>Action</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.</td>
<td>Every 6 months for 2 years and annually thereafter</td>
</tr>
<tr>
<td>Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.</td>
<td>Biannually, but revegetation should take place at the start of the rainy season</td>
</tr>
<tr>
<td>Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.</td>
<td>When necessary</td>
</tr>
<tr>
<td>No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.</td>
<td>When necessary</td>
</tr>
</tbody>
</table>

MONITORING – OPERATIONAL PHASE

The following monitoring and evaluation actions should take place during the operational phase of the development.

<table>
<thead>
<tr>
<th>Monitoring Action</th>
<th>Indictor</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document alien species distribution and abundance over time at the site</td>
<td>Alien plant distribution map</td>
<td>Biannually</td>
</tr>
<tr>
<td>Document alien plant control measures implemented &amp; their success rate achieved</td>
<td>Records of control measures and a decline in alien distribution and their success rate.</td>
<td>Biannually</td>
</tr>
<tr>
<td>Document rehabilitation measures implemented and success achieved in problem areas</td>
<td>Decline in vulnerable bare areas over time</td>
<td>Biannually</td>
</tr>
</tbody>
</table>

**CONCLUSIONS AND RECOMMENDATIONS**

- As there are already a number of alien species present at the site, alien invasion following disturbance at the site is likely to occur rapidly. As a result, alien control should begin during the construction phase to ensure that the density and abundance of alien species remains manageable into the operational phase.
- In the short-term, soil disturbance is likely to be the dominant driver of alien invasion at the site. While, in the long-term the distribution of runoff is likely to be a key driver as those areas which receive water will be wetter and likely to contain a higher alien abundance.
- As disturbance is the major initial driver of alien species invasion, keeping the disturbance footprint to a minimum is a key element in reducing alien abundance. Wherever possible, the indigenous vegetation should be left intact as this will significantly reduce the likelihood of alien invasion.