

# Biodiversity Offset Management Plan

## Approved New Armidale Landfill Facility

Report Number 22678.38513



*Prepared for*

*by*

**AECOM**

Level 11, 44 Market St  
Sydney NSW 2000  
Telephone: 02 8295 3600  
Facsimile: 02 9262 5060

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free Call: 1800 445 389  
ABN: 56 135 005 999

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## Executive Summary

The approved development of the new Armidale Regional Landfill will result in the loss of approximately 12.7 ha of Stringybark Woodland, 0.6 ha of Box Gum Woodland in the Travelling Stock Route (TSR), 6.5 ha of grassland, two small farm dams and 0.5 ha of sedgeland draining into the Gara River. This loss of habitat has been identified as having a significant impact on local populations of four threatened woodland birds (Diamond Firetail Finch *Stagonopleura guttata*, Speckled Warbler *Pyrrholaemus sagittata* Scarlet Robin *Petroica boodang*, and Varied Sittella *Daphoenositta chrysolptera*) as well as the recently listed Little Eagle *Hieraetus morphnoides*. All of these species have been observed on the approved landfill footprint area. Habitat loss to these species will be offset by setting aside adjacent areas of similar areas of vegetation that are likely to respond to conservation measures to permanently improve biodiversity values of the offset area.

Areas of vegetation offset or compensatory habitat are proposed to be developed at a 3:1 ratio (i.e. three times more revegetated area than the area quarantined for landfilling purposes). This will result in the protection and regeneration of approximately 61 ha of land within the overall development site. Offsets would be established across the site within areas not proposed for the actual landfilling operations.

This report provides details of the type, location and size of the vegetation offsets and details of the methodology to be used for establishment, monitoring and management of the offset area. Offset management will include fencing and removal of livestock, revegetation and rehabilitation, weed and feral animal control, and relocation of dead wood and dead trees.

The landfill has received planning approval from the Planning Assessment Commission of New South Wales (PAC) and the Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) (now the Department of the Environment (DOE)) (refer to Appendix A). As part of these approvals, a number of conditions are required to be met, and include:

- Updating the *Biodiversity Offset Management Plan* prepared by EA Systems (17 February, 2010);
- The preparation of management sub plans described in the PAC planning approval Statement of Commitments (SoC) including;
  - Vegetation Management Plan and Vegetation Clearing Protocol (Appendix B);
  - Weed Management Plan (Appendix C);
  - Native Fauna Management Plan (Appendix D);
  - Disease Monitoring Protocol (Appendix E);
  - Pest Management Plan (Appendix F);
  - Fire Management Plan (Appendix G); and
  - Pollution and Litter Management Plan (Appendix H).

This document satisfies these required conditions.

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## 1. Background

### 1.1 Project

A new landfill is needed to provide a long-term disposal solution for the Armidale Dumaresq Council (ADC) and surrounding local government areas (LGA) Uralla and Guyra Councils. ADC is planning to construct a new landfill facility to replace the existing site on Long Swamp Road which has almost reached its capacity. Since 1996, the former Armidale City Council and the current ADC investigated potential sites for the new landfill and identified a suitable location along Waterfall Way, approximately 12 km east of the Armidale (refer to Figure 1). This project was subject to an Environmental Assessment as part of the EP&A Act 1979.

### 1.2 Approval Context

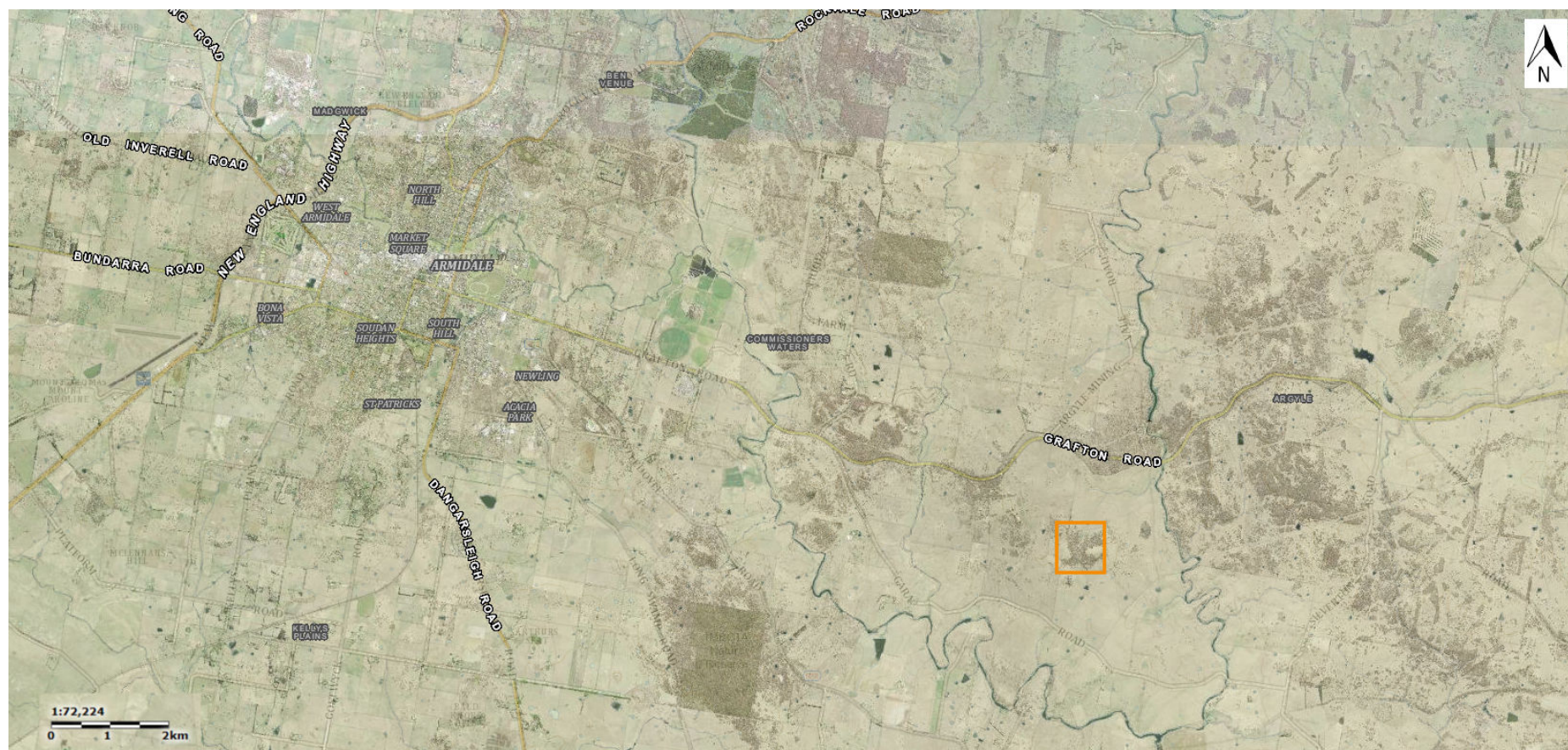
The Armidale Regional Landfill Project was assessed as a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (MP 06\_0220). The Planning Assessment Commission, as delegate for the NSW Minister for Planning and Infrastructure, granted State approval for the project, subject to conditions, on 4 of July 2012. The approval and consent conditions are provided in Appendix A.

The project was declared a 'Controlled Action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and as such required Commonwealth assessment and approval. The Commonwealth Minister for the Environment granted EPBC Act approval, subject to conditions, on 30 August 2012.

The purpose of this Biodiversity Offset Management Plan (BOMP) is to satisfy condition 26 and condition 27 of Schedule 4 of the conditions of consent issued by the former Department of Planning (now Department of Planning and Environment) as follows:

#### **Biodiversity Offset Package**

- 26) *The package must generally conform to Biodiversity Offset Management Plan (BOMP) in the EA and include:*
- a) *the offset areas mapped in the diagram at APPENDIX E;*
  - b) *ongoing monitoring and review for effectiveness;*
  - c) *security in perpetuity to the satisfaction of OEH.*



**Figure 1.** Approximate location of approved ADC landfill facility, Waterfall Way. Approved landfill site denoted by orange square (LPI 2004).

## Conservation Management Plan

27)

- a) be prepared in consultation with the CMA and OEH, by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
- b) be approved by Director General prior to the commencement of construction;
- c) generally conform with the recommendations in the Flora and Fauna Assessment in the EA prepared by EA Systems (17 February 2010);
- d) include detailed specifications for the biodiversity offset package;
- e) specify minimum qualifications for any person involved in biodiversity management;
- f) specify a protocol for tree removal. The protocol must include:
  - a construction schedule showing progressive tree removal to the minimum extent necessary;
  - a prohibition on the use of loud or heavy machinery within 100m of the 2009 Little Eagle nest tree during breeding season (August to January);
  - tree tagging for significant trees that can be retained. Significant trees include:
    - individual stands of *Eucalyptus nicholii*;
    - hollow bearing or known habitat trees or stags;
    - individual stands within a critically endangered ecological community.
  - supervision of any tree removal by a suitably qualified person;
- g) specify Koala management for the site access;
- h) specify a protocol for isolated finds of Aboriginal artefacts;
- i) specify any necessary ongoing management measures.

This BOMP is the supporting document for securing an offset agreement with Office of Environment and Heritage required by condition 26 of Schedule 4. This BOMP has been prepared in accordance with condition 27 of Schedule 4, and acts as the Conservation Management Plan. The BOMP will be implemented once approval from the Director General is issued.

Referring to the PAC Approval located in Appendix A, Table 1 identifies where relevant approval conditions have been addressed in the BOMP.

**Table 1.** Relevant approval conditions addressed within the BOMP

Approval Condition		Addressed in BOMP
27 (a)	Be prepared in consultation with the CMA and OEH, by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General.	The consultation with OEH and CMA is satisfied through provision of a draft BOMP for review.
27 (c)	Generally conform with the recommendations in the Flora and Fauna Assessment in the EA prepared by EA Systems (February 2010).	Throughout BOMP
27 (d)	Include detailed specifications for the biodiversity offset package.	Throughout BOMP
27 (e)	Specify minimum qualifications for any person involved in biodiversity management.	Throughout BOMP
27 (f)	Specify a protocol for tree removal.	Appendix B (Vegetation Management Plan & Vegetation Clearing Protocol)
27 (g)	Specify Koala Management for the site access.	Appendix D (Native Fauna Management Plan)
27 (i)	Specify any necessary ongoing management measures	Throughout BOMP

This BOMP is considered to satisfy the requirements of the CMP, and the Biodiversity Offset Package must generally conform to this BOMP.

### 1.3 Biodiversity Offset Package

As a condition of the project approval, biodiversity offsets are required in accordance with OEH offset policies and the EPBC Act Environmental Offsets Policy where significant project related impacts cannot be avoided or mitigated.

Biodiversity offsets are measures that benefit biodiversity by compensating for the adverse impacts elsewhere of an action, such as clearing for development. Biodiversity offsets help achieve long-term conservation outcomes where development and infrastructure projects are likely to impact biodiversity.

Biodiversity offsets work by protecting and managing biodiversity values in one area in exchange for impacts on biodiversity values in another. For example, if a development requires an area of native woodland to be cleared, another area of similar woodland can be protected, improved and managed for conservation in perpetuity, effectively 'offsetting' the clearing at the development site. The gain in biodiversity achieved by improving a similar area of woodland balances the loss to biodiversity due to the clearing.

Sections 2 and 3 of this management plan detail the biodiversity offsets that will be implemented during the life of the project.

In 2009, EnviroAg Australia (formerly EA Systems) was engaged by AECOM on behalf of ADC to conduct a flora and fauna and habitat assessment over an area of 314 ha for the recently approved development of a new regional landfill facility to be located 12 km east of Armidale on the Waterfall Way. This facility is expected to have an operational life of 50 years. The landfill site will be developed on portions of two rural properties, *Sherraloy* and *Edington*, and a small strip of the adjacent *Gara Travelling Stock Reserve* (TSR) for site access.

The significance of impacts of the approved new landfill on threatened species, endangered populations or endangered ecological communities listed under the NSW *Threatened Species Conservation Act* 1995 (TSC Act) were assessed in accordance with guidelines set out in the

*TSC Amendment Act 2002*. The assessment also considered the impact of the proposed development on matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and potential Koala habitat under the *State Environmental Planning Policy 44 - Koala Habitat Protection*.

The approved development will result in the loss of 12.7 ha of Stringybark Woodland, 0.6 ha of Box Gum Woodland in the TSR, 6.5 ha of grassland, two small farm dams and 0.5 ha of sedgeland draining into the Gara River. Such disturbances reduce the habitat quality of the affected land and may threaten viable populations of threatened species found on the subject site.

It was concluded that the loss of habitat due to the approved development will have a significant impact on local populations of two threatened woodland birds (Diamond Firetail Finch *Stagonopleura guttata* and Speckled Warbler *Pyrrholaemus sagittata*) and three recently listed birds (Scarlet Robin *Petroica boodang*, Varied Sittella *Daphoenositta chrysoptera* and Little Eagle *Hieraaetus morphnoides*) that have been observed on the proposed landfill footprint area. These species were also recorded in the Box-Gum Woodland in the Gara (TSR). Habitat loss to these species on the development site will be offset by setting aside adjacent areas of similar vegetation type that are likely to respond to conservation measures that will permanently improve biodiversity values of the offset area.

Guidelines on how to offset negative impacts upon threatened species and communities of the approved Armidale Regional Landfill facility have been provided by Department of Environment and Conservation (DEC; now Office of Environment and Heritage (OEH)) (Appendix I). These guidelines advise actions and management requirements to maximise the environmental outcomes of offsets recommended for areas surrounding the approved landfill.

## 2. Size of Offsets Required

Areas of vegetation offset or compensatory habitat are proposed to be developed at a 3:1 ratio of offset to impact area (i.e. three times more revegetated area than the area quarantined for landfilling purposes). Offset areas will protect and allow regeneration of approximately 61 ha of land within the overall development site. Offsets would be established across the site within areas of the site that are not proposed for the actual landfilling operations (refer to Figure 2).

The Biometric Tool used in the Property Vegetation Planning (PVP) process typically applies offset ratios to impact area of 20:1 for many threatened species in NSW (NSW Department of Natural Resources 2005). However, in this instance OEH has suggested that there is potential for intensive management of offsets that might greatly improve the biodiversity contribution to the area (Appendix B). Thus, if suitable management effort is incorporated in the proposal, an offset ratio of 3:1 or greater may be appropriate for the landfill (DEC 2006).

Referring to Figure 2, the landfill operational area will occupy 20.3 ha. This includes 12.7 ha of regrowth Stringybark Woodland containing Box Gum Woodland elements (i.e. several individual Yellow Box and Blakely's Red Gum trees), 0.6 ha of Box Gum Woodland within the TSR, 6.5 ha of cleared grassland which will be progressively cleared over the lifespan of the facility, and 0.5 ha of sedgeland. A 3:1 offset to impact ratio will result in an area of 40 ha of Stringybark Woodland, containing individual Yellow Box and Blakely's Red Gum trees, which will be set aside and managed for conservation to compensate for woodland lost to development. The Stringybark Woodland offset areas will be adjacent to the landfill operational area and are part of an existing remnant of Stringybark Woodland that contains Yellow Box and Red Gum trees. An offset of 21 ha of cleared grasslands within the subject site will be set aside for conservation.

The total offset package is the ratio of three parts offset to one part vegetation loss and the conditions require that the offset area is secured in perpetuity to the satisfaction of the EPA. The Department and EPA are both satisfied with this ratio because the package involves intensive rehabilitation of the offset area.





**Figure 2.** Location of the proposed Stringybark Woodland offset area, the grassland offset area and the area of the landfill pit and associated infrastructure (transparent).

Note: The existing Stringybark Woodland contains some elements of Box Gum Woodland (individual Yellow Box and Blakely's Red Gum trees).

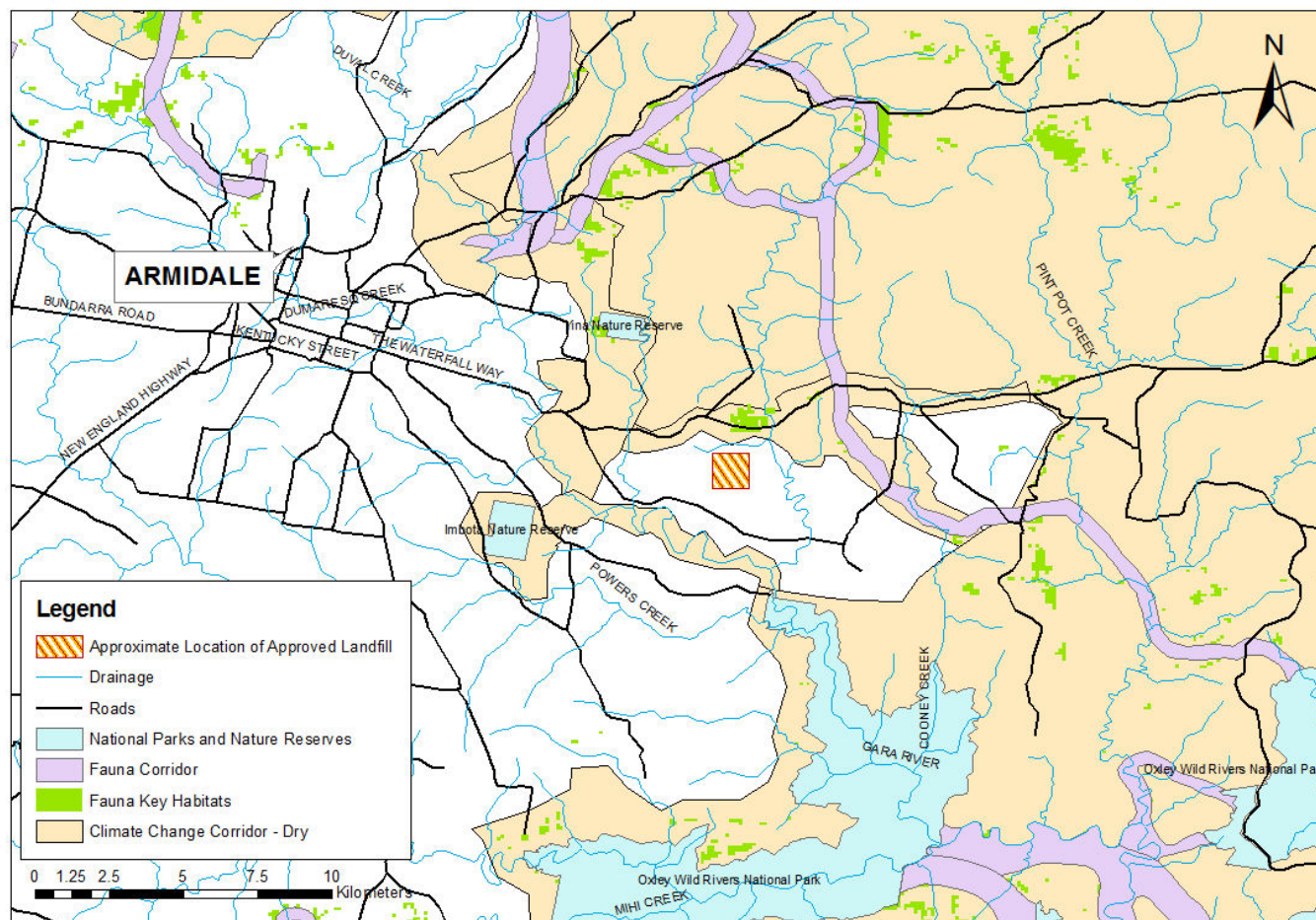
### 3. Location of Proposed Offsets

The proposed compensatory offset area would surround the landfill site and connect to the Gara TSR (refer to Figure 2).

OEH guidelines prefer woodland areas to be connected to form corridors, thereby enhancing biodiversity value. The woodland areas to the south and east of the landfill are core portions of the offset design which will connect to other surrounding areas of woodland.

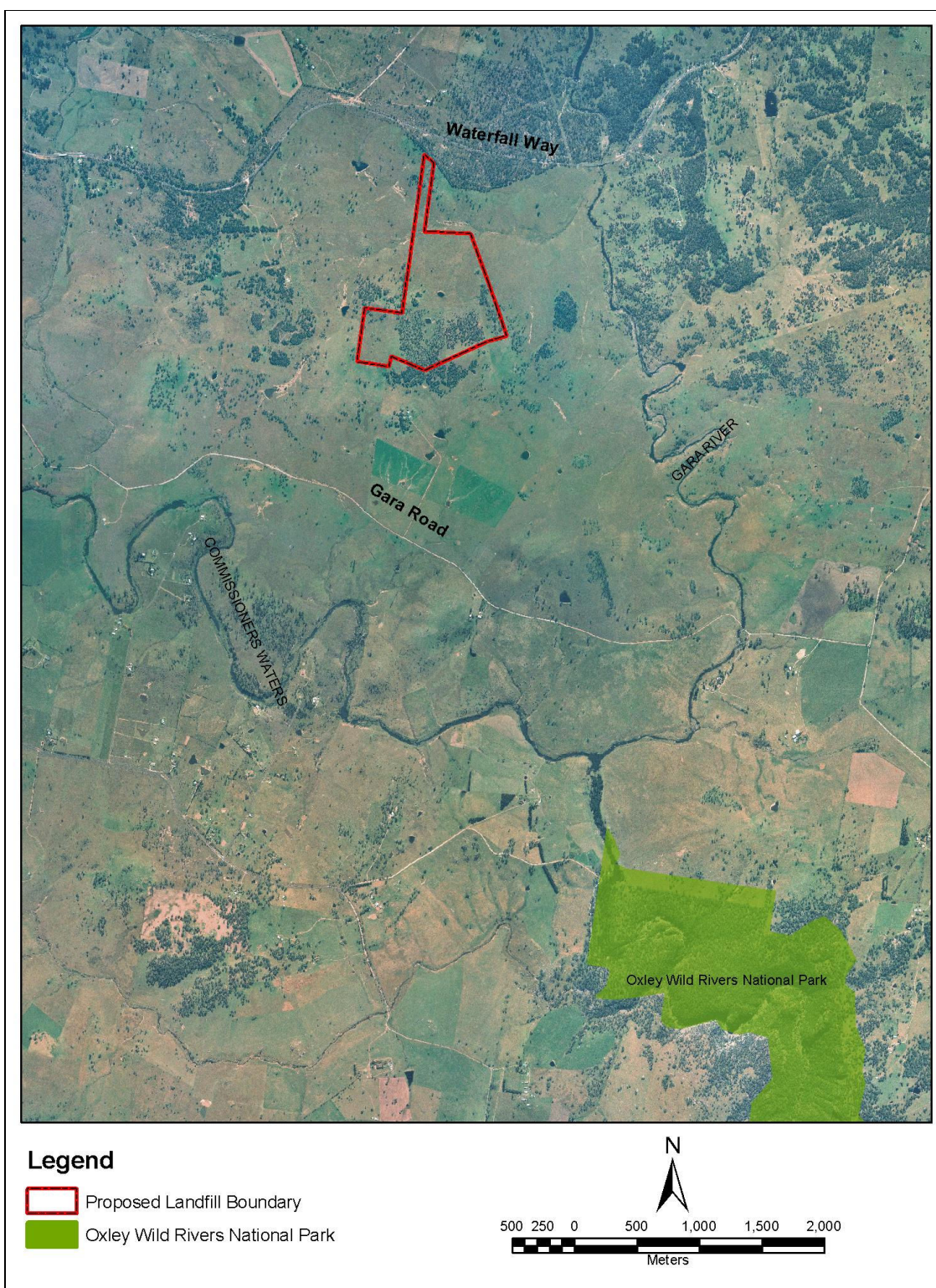
Rehabilitation of areas to the west of the landfill pit would provide a linkage to woodland remnants within 600 m of the development. Fencing of the area, which contains some existing Stringybark trees, will allow for a degree of natural regeneration. However, planting of additional trees in the southern portion of this area will be required to achieve adequate regeneration of the offset area.

Due to the poor condition of existing vegetation at the site and the limited connectivity to surrounding vegetation, the existing remnant woodland currently has low connectivity value. By using mitigation measures to improve the condition of vegetation, and planting buffers to increase connectivity, the site could be improved to be one of high connectivity value (Department of Environment and Climate Change NSW 2008). The development of a vegetation buffer along the access road will create a corridor connecting the offset area to the Gara TSR and the Gara Remnant Subregional Corridor (Figure 2). The access road buffer area shall be a minimum of 100 m wide to provide a suitable dispersal area for fauna (Department of Environment and Climate Change NSW 2008).



**Figure 3.** Office of Environment and Heritage key habitats and corridors east of Armidale, NSW (OEH, 2011)





**Figure 4.** Aerial photo showing local context of study area

## 4. Roles and Responsibilities

The landfill site will not be a manned site. It will have no public access and will only be accessed by landfill operators and other staff as required (e.g. for monitoring). The roles and responsibilities pertaining to this plan are detailed in Table 2.

**Table 2:** Roles and responsibilities

Role	Responsibilities
Waste Manager	<ul style="list-style-type: none"> <li>• Ensure that all operations on site are undertaken in compliance with this management plan;</li> <li>• Ensure all site personnel have received the appropriate training for the responsibilities;</li> <li>• Conduct regular inspections of the work area to monitor compliance with this plan;</li> <li>• Implement controls;</li> <li>• Report any incidences or complaints immediately to the Environment Officer; and</li> <li>• Provide feedback on the adequacy and effectiveness of this plan.</li> </ul>
Superintendent/Environmental Officer	<ul style="list-style-type: none"> <li>• Implementation and compliance of BOMP and Management Plans;</li> <li>• Implementation of required inspections; and</li> <li>• Report to government agencies as required.</li> </ul>
Contractors	<ul style="list-style-type: none"> <li>• Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>• Understand and actively participate in a positive environmental management culture;</li> <li>• Identify improvements or initiatives for environmental management; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>
Consultant Ecologists	<ul style="list-style-type: none"> <li>• Undertake pre-clearing surveys and post clearing inspections to minimise the potential impact on biodiversity of clearing activities; and</li> <li>• Undertake biodiversity surveys of biodiversity offset area (BOA) and rehabilitation in accordance with the annual monitoring requirements.</li> </ul>

### 4.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

## 5. Implementation of BOMP

There are several approaches to restoration of degraded patches of temperate woodland remnants. All involve some form of site amelioration (mitigation measures) and removal of the cause of degradation (e.g. livestock) (Lamb 1994). Depending on the nature of the remnant, remediation may also include a reintroduction of biota (e.g. planting, seeding, fauna introductions) (Lamb 1994). This section details the controls to be implemented for rehabilitation and management of the proposed landfill offset area. The implementation of the BOMP (including rehabilitation and maintenance of the offset area) will generally be undertaken as recommended by the indicative staging plan provided in Appendix J.

### 5.1 Fencing and Removal of Livestock

Livestock shall be removed from the offset and fencing erected as soon as possible. This action alone should substantially improve the condition of the vegetation and quality of the habitat for fauna (Yates & Hobbs 1997). Plant species' richness in temperate eucalypt woodlands is radically affected by livestock grazing (Prober & Thiele 1995). The presence of large numbers of stock on a property (as at the time of the fauna survey in 2005) also causes an unnatural increase in soil nutrients, making it unsuitable for some species of native flora and easing the introduction of exotic weeds (Yates & Hobbs 1997). In general, under heavy grazing pressure, native species become less abundant and are replaced by exotic species. Grazing by hoofed livestock also reduces soil viability through compaction and reduced soil water availability, which in turn leads to tree dieback (Yates & Hobbs 1997). With the removal of stock, these processes will be reversed.

### 5.2 Rehabilitation and Revegetation

All revegetation works will be undertaken by suitably qualified personnel. Revegetation works will include a 2 year maintenance period to ensure effective ground cover has been established. Weed control will continue for at least 5 years post-usage of the site as a landfill.

Pre-clearing collection of locally sourced seeds for direct seeding and/or propagation of tube stock is to be undertaken in spring/summer prior to commencement of works. Seeds and saplings will be taken from the landfill pit area and either immediately replanted in the proposed offset area or, in the case of seeds, stored for future replanting of spent cells in the landfill pit. Further information regarding native seed procurement can be found in Section 4.4.1 of the *Vegetation Management Plan* (refer to Appendix B).

#### 5.2.1 Rehabilitation of Offset Areas

Fencing will be erected to exclude all stock from the offset area. The native vegetation within the grassland offset area (Figure 2) may regenerate naturally after exclusion of livestock. Native plants that grow from natural regeneration will be well-adapted to the site, have high species diversity, and will represent the original range of plant species in the area.

Most of the area within the Stringybark Woodland offset area should regenerate naturally from the existing seed bank and nearby patches of trees (Vesk *et al.* 2009). However, in some areas recruitment can be slow and may require assistance (Yates & Hobbs 1997; Clarke 2002). If understorey regeneration is not satisfactory in areas left for natural regeneration after one year (see Section 6), selected replanting of shrubs and saplings will be necessary in treeless gaps throughout the Stringybark Woodland. The natural recruitment of shrubs has been shown to be episodic and disturbance driven (Clarke 2002), and these species may require planting from tube stock. Planting and seeding is best undertaken following autumn rains in cool, wet conditions to ensure maximum success (Minerals Council of Australia 1998; Vesk & Dorrough 2006).

### *Ground Preparation:*

The southeast corner of the offset area, where few Stringybark trees remain, shall be reseeded and/or replanted. The ground will be prepared using deep ripping to a depth of at least 300 mm to increase water infiltration and to allow for easier root penetration. Deep ripping may also assist in reversing soil structural changes caused by livestock (Yates & Hobbs 1997).

### *Planting:*

Seeds collected from the designated landfill pit area will be used for seeding. Sapling Stringybark trees, if available, will be translocated from the landfill pit area prior to clearing and from the dense Stringybark regrowth area within the offset. An effort will be made to maximise that amount of water available to plants during establishment through reducing competition from weeds. Tree guards may be required to protect the young plants from browsing. Planting in rows and planting of monotypic tube stock will be avoided. Fine-scale patchiness can be developed by spacing trees and shrubs at irregular distances and by not planting in straight rows. In the long-term, management of blocks of vegetation by thinning or strategic burning can be used to enhance patchiness (Bennett *et al.* 2000). Thinning of smaller, immature trees in areas of dense regrowth will be conducted in accordance with OEH guidelines (Appendix I).

Specific management requirements pertaining to rehabilitation and revegetation of the site can be found in Section 4.4 for the *Vegetation Management Plan* (Appendix B).

### **5.2.2 Rehabilitation of Landfill Pit**

Areas that are not immediately required for operational purposes will not be cleared until necessary. This means that vegetation on cells 4 and 5 may not be cleared until at least 30 to 40 years respectively, after operation of the landfill has commenced.

Pre-clearing collection of locally sourced seeds for direct seeding and/or propagation of tube stock will be undertaken in spring/summer prior to commencement of works for the landfill pit. Before collecting seed, consultation must be made with the relevant authorities to establish what permits and licences are required. Seed will only be collected when it is mature. Woody seed cases (e.g. Eucalypts) and pods (e.g. Acacia) change colour from green to brown at maturity and become either brittle or woody (Minerals Council of Australia 1998). Differential ripening within one species or even a single plant may necessitate several visits for seed collection. Seeds will be stored appropriately for future replanting of spent cells in the landfill pit.

### *Topsoil Management and Preparation:*

Topsoil is almost always an essential factor in successful rehabilitation programs. The original soil contains the appropriate seeds, nutrients and microorganisms that are necessary for plant growth and is the best choice to naturally inoculate the site (Dragovich & Patterson 1995; Fiedler & Groom 2006).

The top 100-300 mm of soil removed from the landfill pit needs to be retained and stored for later rehabilitation of the pit (Minerals Council of Australia 1998). It may be feasible to double-strip the topsoil and remove the top 50 mm of soil separately. Seed stores are concentrated in the surface layer and separating a thin layer ensures the majority of seeds remain near the surface from where they can successfully germinate and establish. Soil will be stripped at an appropriate moisture content to avoid compaction and loss of structure (Minerals Council of Australia 1998).



Top soil collected from the landfill pit area prior to excavation shall be stored in low mounds no more than 1-2 m high (Minerals Council of Australia 1998). The stockpile will be revegetated to protect the soil from erosion, discourage weeds, and maintain active populations of beneficial soil microbes. Refer to the *Vegetation Management Plan* (Appendix B) for further information regarding topsoil stockpiles and management.

To re-establish sustainable native vegetation on the spent landfill cells the rehabilitation will commence with landform design and the reconstruction of a stable land surface prior to replacing the topsoil (Minerals Council of Australia 1998).

The stripped topsoil will be tested prior to reuse as topsoil acidity may increase over time (Dragovich & Patterson 1995). The use of gypsum or lime may be required to amend the soil prior to use (Minerals Council of Australia 1998). Although native species are adapted to the low nutrient levels common in Australian soils, improved growth and establishment has been achieved following fertiliser application (Minerals Council of Australia 1998), and the addition of fertilizers and nutrients may be required. Application rates of inorganic fertilisers will be assessed according to the results of soil analysis. Seedbed assessment and manipulation has a strong effect on the success of seedling emergence (Clarke & Davison 2001). The seedbed will not be “over-prepared” as a rough “cloddy” surface reduces runoff and provides better protection for seeds and seedlings (Minerals Council of Australia 1998).

#### *Planting:*

Fencing will be erected around the spent landfill cells prior to planting to protect young seedlings from animals and damage from machinery. Revegetation will be undertaken through, direct seeding, planting of tube stock and natural regeneration from the topsoil seedbank.

Direct seeding has the advantage that the distribution of plants is random. Relatively low numbers of seeds will be applied (0.5 kg/ ha) to allow for a greater diversity of plants to establish through natural regeneration. Seeds used in reseeded should be those collected from the native vegetation prior to construction of the landfill pit. Alternatively, seed can be purchased from a reliable nursery such as the Armidale Tree Group. Seeds of some species may require pre-sowing heat treatment (Minerals Council of Australia 1998). To reduce ant predation, seeds will be treated with ‘CoopeX’ prior to application (Clarke & Davison 2001; Campbell & Clarke 2006; Lomov *et al.* 2009). Seed inoculation with effective root-nodule bacteria (rhizobia) has also been shown to enhance revegetation success (Thrall *et al.* 2005) and should be implemented if seeds have been stored apart from topsoil for a long period (Minerals Council of Australia 1998). Seeding should be conducted after periods of moderate to heavy rainfall and during periods of consistent rainfall to ensure the maximum success (Vesk & Dorrough 2006).

Direct seeding will be used to establish shallow-rooted native grasses, herbs and shrubs. Deep-rooted overstorey species cannot be planted directly on the landfill footprint, as their roots may damage the final capping layer over the spent cells. However, should alternative capping technology be developed allowing for deep-rooted overstorey species, such flora may be considered.

The seed mixture will comprise the most common grasses currently present on the site, potentially including Slender Rat’s Tail Grass (*Sporobolus creber*), Red-leg Grass (*Bothriochloa macra*), Rough Speargrass (*Austrostipa scabra*), Couch (*Cynodon dactylon*), Snow Grass (*Poa sieberiana*), Small Lovegrass (*Eragrostis leptostachya*), Purple Wiregrass (*Aristida ramosa*) and Slender Wallaby Grass (*Austrodanthonia racemosa*). Shrubs are currently not common on-site. Provided the topsoil used to rehabilitate the spent landfill cells is from the existing site, the seedbank should allow shrubs to establish naturally. Seeding with Australian Blackthorn (*Bursaria spinosa*) may assist the shrub layer to establish faster. The shrub layer will be closely monitored to ensure that flora species of value to the threatened fauna species identified on the site are established (Bennett *et al.* 2000). A list of flora species

identified on site is located in Appendix K. Tree guards may be required to protect shrubs from browsing (Kasel 2008).

Planting in rows and planting of monotypic tube stock will be avoided (Munro *et al.* 2009). Direct seeding sourced from adjacent patches and regeneration of native plants will result in the most natural outcome. Fine-scale patchiness can be developed by spacing trees and shrubs at irregular distances and by not planting in straight rows. In the long-term, management of blocks of vegetation by thinning or the use of fire can be used to enhance patchiness (Bennett *et al.* 2000).

Recent studies have shown that the use of mulch after replanting reduces the diversity of re-established flora (Fiedler & Groom 2006). Given the relatively mesic environment of the Armidale area, mulch should not be required and its use will be avoided. Instead, an effort will be made to maximise that amount of water available to plants and seeds through reducing competition from weeds. Care must be taken to not disturb the topsoil after seeds have started to germinate as this will cause a substantial reduction in plant establishment (Minerals Council of Australia 1998).

For one year after planting the survival rates of plants will be assessed to determine the necessity for replacing dead plants. It is assumed that 10% of the seedlings will require replanting.

Management of the landfill area will be adaptive depending on the responses of native flora and fauna to rehabilitation and management actions. Unforeseen changes in conditions may result in minor adaptations to management actions in order to improve the chances of favourable outcomes from year to year.

Specific management requirements pertaining to rehabilitation and revegetation of the site can be found in Section 4.4 for the *Vegetation Management Plan* (Appendix B).

### 5.2.3 Buffers

Vegetated buffers will be planted along the access road and around the landfill pit and infrastructure areas (within the offset areas and outside the landfill perimeter fencing). These areas will be established and planted in the early stages of project construction and removal of existing vegetation from the landfill pit be delayed as long as possible to achieve maximal overlap.

Buffer plantings along the access road will be designed to supplement existing native stands and enhance connectivity between patches of remnant vegetation, including the Gara TSR (refer to Figure 2). Native trees and shrubs will be planted in a configuration to mimic the natural landscape and will occupy the maximum width of the road corridor.

All plantings will consist of locally occurring native species, propagated from locally collected seed or other propagules. Shrubs, herbs and grasses will mostly be allowed to regenerate naturally.

Planted buffer areas will be maintained by a suitably qualified person for a period of 24 months. During this period any trees that die will be replaced. Additional seeding will be implemented as necessary. Wooded areas shall be monitored to ensure regeneration includes all facets of native vegetation and the establishment of weeds is prevented (see Section 6).

A firebreak shall be constructed around the perimeter of the landfill pit and the perimeter of the biodiversity offset areas (stringy bark and grassland).

### 5.3 Removal of Mature Trees

The number of mature trees requiring removal within the proposed landfill areas will be limited to the minimum necessary for the safe construction and use of the approved development. Mature trees to be retained will be marked to ensure machinery operators take due care in their vicinity and minimise any damage that may otherwise occur.

Prior to removal of hollow-bearing trees in woodlands and grasslands, hollows will be checked for nestlings and arboreal mammals, such as possums and insectivorous bats. Diurnal and nocturnal stag watches will be undertaken for each hollow-bearing tree or cluster of trees. Tree hollows will be re-checked for animals after felling or pushing. All fauna found will be safely relocated to the offset areas with the supervision of a zoologist or wildlife rescuer. Injured or sick animals will be taken directly to a local veterinarian for treatment.

A vegetation clearing protocol is provided in Section 5 of the Vegetation Management Plan (Appendix B)

### 5.4 Weed Control

The control of exotic plant species is one of the most important issues for any eucalypt woodland restoration program (Yates & Hobbs 1997). Without adequate control of weed species, any areas left for natural regeneration may rapidly become overrun by exotics.

Twenty-eight (28) weed species were recorded in the grassland, sedgeland and Stringybark Woodland communities within the landfill development area. The dominant species were Spear Thistle (*Cirsium vulgare*), which dominated some areas of grassland, and Hawthorn (*Crataegus monogyna*), Blackberry (*Rubus fruticosus*) and Sweet Briar (*Rosa rubiginosa*) mostly within the numerous large log piles in the Stringybark Woodland.

One (1) species of noxious weeds, Blackberry (*Rubus fruticosus*), declared under the *Noxious Weeds Act 1993* for the Armidale Dumaresq Local Government Area (LGA) was identified within the study area. Although not currently present on site, control and monitoring of invasive exotic grasses, such as Coolatai Grass, Serrated Tussock, and Chilean Needlegrass, which may spread from the Waterfall Way access route to the new landfill site will also be undertaken. Management of weeds shall be undertaken as required by law under the *Noxious Weeds Act 1993*. Additionally, although not considered noxious in the Armidale Dumaresq LGA, other invasive exotic flora were identified and include: African lovegrass (*Eragrostis curvula*), Bathurst Burr (*Xanthium spinosum*), and Sweet Briar.

Noxious weeds will be treated with spot-spraying of glyphosate and thinning/slashing/pulling implemented where required. All use of herbicide must comply with the directions on the attached labeling and with regard to the provisions of the *Protection of the Environment Operations Act 1997*. The 'cut-and-paint-stump' method is recommended for removal of woody weeds (Blackberry, Sweet Briar and Hawthorn). This involves completely cutting the trunk or stem of the plant as near as practical to ground level and applying a herbicide to the cut surface within 30 seconds.

Weed control will continue for up to 5 years after planting/seeding of offset areas and spent landfill cells. Two comprehensive searches for weeds will be implemented each year, one in late spring (November) and another in late summer (February).

It is unlikely that weeds will spread neither from landfill waste placed in the operational pit areas nor from rehabilitated pit areas since green (garden) waste will be processed at the Long Swamp Road Waste Transfer Station. It is understood that Council does not intend to landfill any green waste at the proposed development site on Waterfall Way. The potential introduction and spread of weeds from the landfill is more likely to be associated with soil disturbance and earthworks during the construction and rehabilitation phases of the landfill operation.

Weed management is to be implemented in accordance with the *Weed Management Plan* (refer to Appendix C). Measures include:

- Wash down vehicles to remove weeds and weed seeds to prevent spread to new areas. Wash down will occur in a dedicated area where runoff can be contained and weeds treated;
- Ensure that all materials imported onto the site are weed and disease free;
- Monitor and control weeds following ground disturbance and construction works: use only non-residual herbicides and those without surfactants (spreading agents) in the vicinity of drainage lines (surfactants can lead to suffocation of amphibians);
- Residual herbicides may be used in table drains only if they are used in a spot spray manner (residual herbicides persist in the soil and can be washed into watercourses);
- Appropriate control of drainage and run-off that may spread weed seeds or high levels of nutrients.

## 5.5 Pest Management

Pest Management is to be implemented in accordance with the *Pest Management Plan* (refer to Appendix F).

Habitat modification may be the most suitable technique for rabbit control. Removal of surface refuge greatly enhances the effectiveness of control programs and slows recolonisation. This may be achieved through measures such as dismantling existing log piles and removing blackberry thickets. Due to the presence of raptors (e.g. Little Eagle, now listed as a vulnerable species under the Threatened Species Conservation Act (TSC Act), and is therefore protected by law) at the site, baiting with 'Pindone' will not be used as evidence suggests that miss-targeted baits pose a significant risk (see Olsen *et al.* 2013). However, the use of 1080 may be suitable alternative. Log piles will be dispersed as individual logs scattered throughout the offset areas (both Stringybark and grassland), to retain fauna habitat (e.g. foraging substrate for threatened birds) while minimising shelter for Rabbits.

Shootings must be undertaken by licenced personnel and be undertaken in a humane way to reduce the risk of suffering to the animal. Trappings are permitted under the *Rural Lands Protection Act 1998*. Shooting and trapping will only be carried out during the advanced control step and be implemented only to catch any remaining rabbits.

The reduction of rabbits at the site will help to control fox and potential cat populations in the area. The removal of log piles will also serve to reduce harbour available for these species. Covering waste in a timely manner will reduce exposure of waste to these pest species and minimize enticement.

If an outbreak is detected, a professional exterminator shall be employed.

## 5.6 Relocation of Dead Wood and Dead Trees

Vegetation removal and relocation is to be implemented in accordance with the *Vegetation Management Plan* (refer to Appendix B).

Hollow-bearing stags in the grassland and hollow-bearing trees from Stringybark Woodland in the landfill area will be relocated to offset areas as logs, or erect as stags if feasible, in line with OEH recommendations (Appendix I).

Log piles within the landfill pit area of the Stringybark Woodland will be redistributed to the offset areas and dispersed as single logs to emulate natural conditions (Munro *et al.* 2009). Fallen branches and timber will be allowed to accumulate over time in the offset area. Stumps

with the potential to stand upright should be positioned to allow for birds and arboreal mammals to use the hollows for nesting and roosting.

## 5.7 Enhancing the value of the offset for native fauna: structural complexity

Specific management measures to minimize disturbance of native fauna habitat are identified in the *Native Fauna Management Plan* (refer to Appendix D), the *Vegetation Management Plan* (refer to Appendix B) and the *Pest Management Plan* (refer to Appendix F). A *Koala Management Plan* can be found within the *Native Fauna Management Plan*.

Fauna depend on a diversity of vegetation types and structural complexity to provide foraging substrate, shelter and nesting habitat (Bennett *et al.* 2000; Kavanagh *et al.* 2007) and structurally complex revegetation will support a greater diversity of species (Munro *et al.* 2007). To support fauna that may be displaced and negatively impacted by the development, natural layers of structural complexity and patchiness of vegetation must be re-established in the offset area through a mixture of plant species regrowth (Munro *et al.* 2009). Layers of vegetation can be established by selecting plants that grow to different heights, such as trees, tall shrubs, low shrubs and groundcover. Fine-scale patchiness can be developed by spacing trees and shrubs at irregular distances and by not planting in straight rows. In the long-term, management of blocks of vegetation by thinning can be used to enhance patchiness (Bennett *et al.* 2000).

The habitat requirements of animal assemblages and species differ widely. Studies of arboreal marsupials have shown that some members of this group can recolonise revegetated areas if hollows are present or provided as nest boxes (Suckling & Goldstraw 1989). Complex groundcover elements, including fallen logs and debris, are essential for recolonisation by small native terrestrial mammals (Munro *et al.* 2007). Refer to Appendix L for site photos of existing vegetative groundcover. The number and diversity of avian species inhabiting revegetated woodland appears to be directly related to the composition of the vegetation layers with the development of the understorey being of particular importance (Munro *et al.* 2007). Studies show that common bird species can recolonise revegetation within 2-3 years provided the understorey is well-developed (Munro *et al.* 2007). Bird species richness tends to increase with revegetation age and declining and uncommon birds may take more than 8 years to recolonise (Taws *et al.* 2001).

Several threatened species of birds are likely to be displaced due to construction of the landfill pit. However, the impacts will be minimised through the staged clearing required for construction of the landfill over its proposed 50 year lifespan. This will allow the maximum possible amount of habitat to remain while the Stringybark offset area becomes progressively more established. A complex structural habitat, with multiple layers of vegetation, will be established in the offset areas prior to extensive clearing for the landfill pit and associated infrastructure. The habitat requirement for each of these species differs:

The Diamond Firetail Finch (*Stagonopleura guttata*) builds bottle-shaped nests in trees and bushes, but largely forages on the ground for grass seeds and insects. This species will require well-established overstorey, shrubs and groundcover to successfully inhabit the offset area.

The Speckled Warbler (*Pyrrholaemus sagittata*) nests and forages on the ground for arthropods and seeds in grassy patches, leaf litter and shrub cover (Ford *et al.* 1986) and are thus very susceptible to predation. The successful assessment of groundcover and a shrub layer is important for the survival of this species. However, more important for the survival of this species are the removal of existing introduced predators on the site (Foxes) and the prevention of an increase of cat numbers on the site as a result of the landfill. Speckled Warblers are known to respond well to replanted eucalypt woodlands (Kavanagh *et al.* 2007).

Varied Sittellas (*Daphoenositta chrysoptera*) forage socially on insects, by clambering among tree branches and probing bark and dead wood. They build an open, fibrous nest in upright dead forks of trees (Higgins & Peter 2002). The successful establishment and retention of mature trees on the site is paramount to the survival of this species.

Scarlet Robins (*Petroica boodang*) forage on insects, mostly by pouncing to the ground from a low perch. They build an open, fibrous nest, typically in a fork of a mature living tree and sometimes on a dead branch (Debus 2006). A well-established groundcover layer and tree canopy are required by this species.

The location of the proposed access road through the TSR and the location of the approved landfill operational area do not contain core or potential Koala habitat. However, In March 2005, one (1) Koala was recorded on the TSR, but was not observed in 2009. Evidence of Koala presence (scat and scratches) was recorded in the landfill footprint area in 2009. A *Koala Management Plan* is included in the *Native Fauna Management Plan* (Appendix D).

It is expected that the Little Eagle (*Hieraaetus morphnoides*) pair on the site will move to a new nest location when: a) their nestling has fledged and disturbance near the nest/roost tree increases; and b) the number of Rabbits, their primary food source on the site, is reduced. Thus, it is predicted that the Little Eagles will not be significantly impacted by the development provided several large mature trees, such as Yellow Boxes are retained on the site (Broese *et al.* 2009). Little Eagles breed in a stick nest in a living woodland tree and the long nesting cycle lasts from late winter to early summer (Debus *et al.* 2007; Debus and Ley, 2009; Debus, 2011). Prior to the commencement of any site construction, tagging for significant trees, within the construction area, that can be retained, will be conducted and will include the following trees:

- Individual stands of *Eucalyptus nicholii*;
- Mature trees that have been identified as containing Little Eagle (*Hieraaetus morphnoides*) nests. If this is impracticable, include a tree with similar characteristics (e.g. tall Yellow Box with mistletoes) in the offset zone (refer to Section 4.3 of *Vegetation Management Plan* (document reference 23464.62561));
- Hollow bearing or known habitat trees or stags; and
- Individual stands within a critically endangered ecological community.

The successful establishment of a multi-layer complex habitat may also offer the native species some protection from exotic and native pest species. For example, Noisy Miners (*Manorina melanocephala*) are an increasing problem in Australian landscapes and dominate small patches and competitively exclude other small woodland birds (Ford *et al.* 2001). The establishment of shrubs, such as native Acacias, in the offset woodland may reduce the number of Noisy Miners (Hastings & Beattie 2006). In a study by Hastings and Beattie (2006), the greatest abundance and richness of small birds occurred in plantings combining eucalypts with at least 15% Acacias. Hastings and Beattie (2006) recommend that eucalypt plantings be supplemented with both Acacias (preferably bipinnate) and a shrubby understorey to deter Noisy Miners. Although there are no legislative requirements associated with control of the Noisy Minor, Noisy Miners have been listed as a Key Threatened Process for some species of threatened birds, under the *Threatened Species Conservation Act*, 1995.

## 6. Offset Monitoring and Review

On-going annual monitoring of revegetation is required to determine the success of regeneration within the offset areas and within the landfill pit as each cell is rehabilitated. Vegetation surveys of established monitoring plots will be undertaken in late spring-summer to maximize the numbers of species recorded and ensure accurate identification. Monitoring plots will be established in the offset area prior to vegetation removal for the landfill pit and infrastructure.

Understorey response to grazing removal will be monitored from the outset. If understorey response is minimal, assisted regeneration (revegetate with local tree and shrubs seeds or seedlings) will be required, especially in treeless areas. A density of >2,000 stems per 5 ha is considered adequate regrowth. Growth and stand structure response shall also be monitored to assess the response of the understorey to thinning.

Appendix N of the *Biodiversity Offset Management Plan* provides a monitoring protocol required by the Office of Environment and Heritage.

Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for vegetation management.

### 6.1 Establishment of plots for ongoing vegetation monitoring

Prior to vegetation removal for the landfill pit and infrastructure, vegetation monitoring plots (20 x 50 m) will be established in the designated offset areas. A minimum of three plots shall be established in representative vegetation for the grassland area, three plots established in the Stringybark vegetation in good condition (regrowth), and three in the areas that will likely require revegetation (areas near Stringybark Woodland currently designated as grassland; Figure 2) for a total of nine monitoring plots.

These plots aim to detect changes in response to site rehabilitation and monitoring shall commence with the collection of baseline data. This information will provide the benchmark from which ongoing monitoring will be measured and assessed in terms of the success of the rehabilitation works.

### 6.2 Monitoring vegetation regeneration (diversity assessment)

Within the 50 x 20 m plot, numbers of individual stems of native trees and shrubs by species will be counted to determine diversity. Dead trees or stumps >1 m high will also be counted and denoted as 'dead tree'.

Trees less than 10 cm in diameter will be further classified in terms of height. This will assist with the monitoring of seedling growth and regeneration. A density of >2,000 stems per 5 ha is considered adequate regrowth. Less than 2,000 stems per 5 ha area will require assisted rehabilitation by planting or seeding of native species.

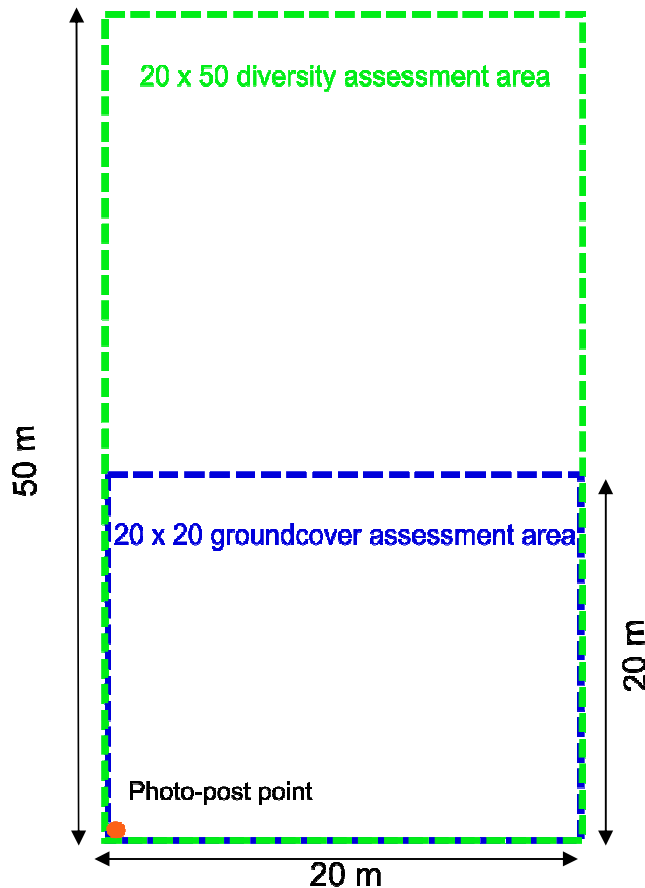
The number of vegetation layers (strata) will be noted and described in categories for trees, tall shrubs, low shrubs and groundcover (Thackway *et al.* 2006). Notes will be made of the presence of exotic weed species where appropriate.

The abundance of fallen timber >10 cm diameter will be recorded in terms of the total length of logs present in each transect. Logs will be separated into diameter size classes related to the tree diameter at breast height (DBH).



### 6.3 Monitoring Groundcover

Vegetation groundcover will be assessed within the 20 x 20m plot as percentage of native grasses, native shrubs, native other (forbes and herbs) and exotic plant cover. For the baseline study, all native and exotic species will be identified to species. The quality of the remnant vegetation community present will also be assessed for the level of ground disturbance (from animals or human activity) and organic litter coverage.



**Figure 5.** Monitoring plot layout

### 6.4 Photo Points

A digital photo will be taken at the southwest corner of each plot and the location and aspect recorded using a GPS and compass. The location of the photo point will be marked using a labelled star picket as a permanent marker.

### 6.5 Reporting

Reporting of monitoring and management information is an integral component of the success of the landfill project. This section outlines the internal and external biodiversity monitoring and management reporting processes. Table 2 outlines the types of reports required, frequency, requirements, distribution and timing.

**Table 3:** Reporting schedules for Biodiversity Monitoring and Management

Report	Frequency	Requirements	Distribution	Timing
Biodiversity Non-Compliance or Incident	As required	Requirement under condition 6 of Schedule 5, project approval. Complete incident report form or detailed report of biodiversity non-compliance/incident including cause/nature, date, time, duration and location of event; contact details of ADC representatives or witnesses; action taken and measures to prevent recurrence.	OEH/EPA DoP	Within 7 days of incident occurring
Complaints	As required/monthly	Complete ADC complaints form including person making complaint and details, complaint reported, time & date, time & date of incident, complaint method, action taken and follow up contact. Update complaints register with summary of complaints received on monthly basis.	OEH/EPA DoP  ADC website	As soon as practicable/ Annual review  Within 14 days of incident
Pre-clearing and clearing report	Following clearing event	ADC to report on methods and results of pre-clearing and clearing survey.	OEH	Following clearing
Flora and Fauna Monitoring	Annually	Suitably qualified contractor to compile and analyse result of the winter and spring flora and fauna monitoring and submit to ADC	ADC	Following spring monitoring
AEMR/Monitoring Protocol	Annually	Summarise operational and environmental activities for the previous year including annual review requirements, review of compliance with project approval, other approvals, and description of non-compliance/exceedences, rehabilitation progress, comprehensive monitoring results and complaints information.	OEH/EPA ADC website	Stated on EPL

### 6.5.1 Incident

Upon detecting an exceedence of the limits/performance criteria in the project approval or the occurrence of an incident that causes (or may cause) material harm to the environment, ADC shall immediately (or as soon as practical thereafter) notify the Department and other relevant agencies of the exceedence/incident. Within seven (7) days of the date of the incident, ADC shall provide the Director-General and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

## 6.6 Review

A key component of this BOMP and associated management plans is that ADC is able to review the effectiveness and performance of biodiversity management onsite. ADC will implement a number of review processes to ensure that there is continuous improvement of biodiversity management including:

- Biodiversity Offset Management Plan Review;
- Biodiversity Performance Annual Review; and
- Independent Environmental Audit.

Any of these review mechanisms may trigger a revision of the BOMP.

### 6.6.1 Biodiversity Offset Management Plan Review

Within three (3) months of the submission of an:

- Annual review under condition 4 of Schedule 5 the project approval;
- Incident report under condition 6 of Schedule 5 the project approval; or
- Independent environmental audit under condition 8 of Schedule 5 of the project approval,

ADC shall review, and if necessary revise the BOMP and/or associated management plans to the satisfaction of the Director-General. This is to ensure that the plans are updated on a regular basis and incorporate any recommended measures to improve the environmental performance of the project.

A protocol for the BOMP review is provided in Appendix M. ADC will annually complete the BOMP review protocol prior to writing the Annual Review section of the annual review. The BOMP review protocol will outline the management measures of the previous year, track progress against the objectives and targets, changes to risks, demonstrate whether accountabilities have been followed, and that inspections and reporting process have been completed. The outcomes from the BOMP review will be incorporated into the annual review section of the annual report.

### 6.6.2 Biodiversity Performance Annual Review

ADC will review annually biodiversity performance and management as part of the annual report in accordance with Schedule 5, Section 4 of the project approval. The annual review will include a comprehensive review of the biodiversity monitoring results and complaints over the previous year and make comparisons of these results against the following:

- Completion criteria, objectives and targets;
- Biodiversity monitoring results from previous year;
- Discuss any biodiversity non-compliances and what actions were taken;
- Identify any trends in biodiversity monitoring data;
- Identify any discrepancies between predicted and actual monitoring results and discuss potential causes;
- Outline management measures to be implemented over the next year to continually improve biodiversity management; and
- Outline whether a revision of the BOMP is required.

### 6.6.3 Independent Environmental Audit

ADC is required to undertake an independent environmental audit within a year of the commencement of operation of the project, and every 3 years thereafter, unless the Director General directs otherwise as stipulated in Schedule 5, Section 8 of the project approval. ADC will commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:

- Be conducted by suitable qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
- Include consultation with relevant agencies;
- Assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant Environmental Protection License;
- Review the adequacy of any plans or programs required under these approvals; and if appropriate;
- Recommend measures or actions to improve the environmental performance of the project, and or any plans or program required under these approvals.

The audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.

Within six (6) weeks of completing the audit, or as otherwise agreed by the Director-General, ADC shall submit a copy of the audit to the Director-General, together with its response to any recommendations contained in the audit report.

## 7. Statement Addressing the Principals of Biodiversity Offsetting

The Department of Planning and Infrastructure has outlined a number of principles for biodiversity offsetting (Appendix I). The points below address each of the principles in terms of the conditions on the approved landfill site.

### 1. Offsets are used to address residual impacts following consideration and implementation of options to avoid, minimise and mitigate impacts.

Options to avoid, minimise and mitigate impacts of the proposed landfill on threatened species and ecological communities have been taken into consideration and are discussed in Broese *et al.* (2009). Offsets will be used to create additional habitat for four species of woodland birds that will lose territories for individual pairs as a result of landfill construction.

The area designated for the landfill is currently highly degraded. The condition of the proposed offset areas will be rehabilitated according to OEH's recommendations (DEC 2006) and the condition will gradually improve to a status more suitable for species conservation.

The construction of the landfill pit will be completed on a cell-by-cell basis. Thus, vegetation in the final cells will not be cleared for 30-40 years after commencement of landfill use. After each cell is full, it will be covered and rehabilitated. This will minimise the size of the area impacted at any given point in time.

### 2. Offsets should be based on an agreed understanding of the conservation significance of the impact and offset values.

A full assessment of the conservation significance of threatened species and vegetation communities was conducted as part of the flora and fauna assessment (Broese *et al.* 2009). The proposed offset areas are of the same vegetation types as the proposed clearing, a 3:1 ratio of offset to impact area for Stringybark Woodland and native grassland.

An important component of the offset is their potential to maintain or increase the connectivity value of the landscape. The vegetated buffer to be reconstructed along the access track will link habitat between the Stringybark Woodland in the south of the site with Box-Gum Woodland in the north in the Gara TSR (Figure 2).

### 3. Offsets should maintain or improve identified biodiversity values secured into the future.

Mitigation measures and rehabilitation of the offset area should compensate for the loss of biodiversity within the impact area. The OEH has agreed to a 3:1 offset ratio to provide habitat for the woodland bird species to be impacted by the development. The mitigation measures proposed for the offsets, including exclusion of grazing, redistribution of fallen timber (as single logs), and weed and pest control will improve the conservation value of the site overall. These mitigation measures should improve tree recruitment and understorey condition and diversity in the landfill and offset areas (Yates & Hobbs 1997).

### 4. Offsets should be based on a "like for like" basis.

Clearing of 12.7 ha of Stringybark Woodland and 0.6 ha of Box Gum Woodland will be replaced by the conservation and improvement of 40 ha of similar Stringybark Woodland regrowth area. As the Stringybark Woodland in the proposed landfill area contains Box Gum Woodland elements, the Stringybark Woodland offset area will be enhancement planted with Yellow Box and Blakely's Red Gum trees, particularly in the vicinity of existing trees of these species in the Stringybark offset area. Clearing of 6.5 ha of grassland and 0.5 ha of sedgeland will be replaced by the conservation and improvement of 21 ha of cleared grassland.

## **5. Offset area should be greater than the area impacted.**

A 3:1 offset to impact ratio has been proposed for the landfill site (DEC 2006).

The area proposed for the offset of both Stringybark Woodland and grassland is in similar condition to the area to be cleared. The condition of the offset areas will be improved by mitigation.

## **6. Offsets should generally be in proximity to the area impacted.**

The offsets will be adjacent to the Stringybark Woodland and grassland to be impacted, respectively. Applying the offset locally minimizes the risk that any one area receives an unreasonable burden of impacts without receiving the benefits that offsetting can provide. Providing offsets and improving habitat condition adjacent to the impact areas should allow the four threatened bird species at the site to relocate from the impact area to the offset area and the genetic diversity of the populations in the local area will be retained.

## **7. Offset actions should be located in areas of strategic regional conservation value where Principle 6 does not apply.**

Principal 4 (like-for-like) and principal 6 (offset adjacent to impact area) have been satisfied for this proposal.

## **8. Offsets should be in addition to existing initiatives.**

The proposed offset areas are in addition to mitigation measures proposed for the site in the flora and fauna assessment (Broese *et al.* 2009). Initiatives include assisted regeneration of degraded habitat, relocation of logs from log-piles, fencing, and pest and weed control.

## **9. Offsets should minimise ecological risks from time lags.**

Construction of the landfill pit and infrastructure will not commence until offsets have been designated and rehabilitation of suitable areas of the site has commenced. Fencing and rehabilitation of the offset areas will commence as early as possible.

Each cell of the landfill will be rehabilitated as it is completed and unused cells will not be cleared until they are needed.

## **10. Offsets should be secure, long term and auditable.**

Offset areas can be protected in perpetuity through:

- Vesting ownership in Council, Land Trust or BioBank;
- A formal conservation agreement (Voluntary Conservation Agreement (VCA) under the NPW Act bound to title prior to on-selling; or
- A covenant on title placed on the land under section 88b of the Conveyancing Act 1919.

The appropriateness of targets and strategies of the management plan will be reviewed every three (3) years.

Mandatory documentation of offset agreements must convey full details about all locations and actions involved in an agreement. A spatial record on a centralised GIS spatial database, managed by OEH and accessible by OEH officers is also required (DEC 2006). Additionally, a Monitoring Protocol (Appendix N) will be completed to ensure consistency and to satisfy consultation to date with OEH.

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## **Appendix A.      Project Approvals**



Australian Government

Department of Sustainability, Environment, Water, Population and Communities

## Approval

### Armidale Regional Landfill, NSW (EPBC 2007/3646)

This decision is made under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

## Proposed action

**person to whom the approval is granted** Armidale Dumaresq Council

**proponent's ABN** ABN: 63 781 014 253

**proposed action** To develop a regional landfill on portions of Lot 2 DP 253346, Lot 1 DP 820271 and Lot 1 DP 253346 in the Parish of Gara, Armidale, NSW [See EPBC Act referral 2007/3646].

## Approval decision

Controlling Provision	Decision
World Heritage properties (sections 12 & 15A)	Approved
National Heritage places (sections 15B & 15C)	Approved

## conditions of approval

This approval is subject to the conditions specified below.

## expiry date of approval

This approval has effect until 31 December 2062.

## Decision-maker

**name and position** James Tregurtha  
Assistant Secretary  
South-Eastern Australia Environment Assessment Branch

**signature**

**date of decision**

30 August 2012

## Conditions attached to the approval

1. The person taking the action must ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the development in any NSW Environmental Protection Licence issued for the proposed action or relevant provisions of the *NSW Protection of the Environment Operations Act 1997*.
2. Prior to commencement of the action, the person taking the action must prepare a Leachate Management Plan for the Minister's approval. The plan must include a ground and surface water monitoring plan for the site, a remedial action plan to provide contingencies in the event that leachate escapes the leachate containment system and include details on:
  - a) the number, design and location of the monitoring bores, including upstream groundwater bore/s for baseline data collection;
  - b) timelines for establishment and sampling regime(s) for the monitoring bores;
  - c) monitoring frequency, including monitoring during rainfall;
  - d) a schedule of contaminants to be monitored;
  - e) triggers for increased monitoring and remedial action; and
  - f) reporting requirements for the sampling results.

The person taking the action must install the baseline monitoring bore and implement the baseline monitoring sampling program before commencing **construction** of the landfill.

3. The person taking the action must ensure that the leachate storage dam:
  - a) is designed to address dispersive soil in the A2 and B soil horizons;
  - b) allows for the level of leachate in the storage dam to be maintained such that there is no overflow;
  - c) is designed to contain a 100-year ARI 3 day rainfall event and provides at least 150mm freeboard for wave action, providing a total storage capacity of at least 14.6ML;
  - d) includes a leachate barrier comprising:
    - i. a re-compacted clay or similar material at least 90 centimetres thick with an in situ coefficient of permeability of less than  $10^{-9}$  metres per second covering the entire floor and walls of the dam/s;
    - ii. a flexible membrane liner stabilised against or protected from ultra violet light with a minimum co-efficient of permeability of less than  $10^{-14}$  metres per second covering the entire floor and walls of the dam/s.
4. The person taking the action must ensure that the stormwater infrastructure design:
  - a) directs all sediment laden water in overland flow:
    - i. away from the leachate containment system; and
    - ii. to a sediment basin with capacity for a 5 day 95th percentile storm with a minimum storage capacity of 5250m<sup>3</sup>.
  - b) includes a dry detention basin below the operational parts of the site with capacity for a 100 year ARI 3 day rainfall event with a minimum storage capacity of 30ML;

The person taking the action must manage the sediment basin so that it maintains capacity to store run-off from the 5 day 95th percentile storm.



5. The person taking the action must comply with the provisions of the Armidale Regional Landfill Facility Water Quality Monitoring Program and Management Plan.
6. Prior to commencement of the action, the person taking the action must prepare an outline Landfill Closure and Site Rehabilitation Plan for the Minister's approval. The plan must:
  - a) describe the final landform;
  - b) ensure the site, including capped landfill cells, are equivalent to Class 4 agricultural land under the Agricultural Land Suitability Classification guideline;
  - c) include post-closure monitoring of ground and surface waters for a period of 20 years after the landfill is decommissioned;
  - d) include post-closure monitoring of leachate; and
  - e) include remedial actions to be implemented in the event of leachate escape from the leachate containment system.

The person taking the action must submit the final Landfill Closure and Site Rehabilitation Plan for the Minister's approval (addressing all the requirements of 6a to 6e above) at least 1 year prior to the closure of the landfill. The final approved plan must be implemented.

7. Within 10 days after the **commencement** of the action, the person taking the action must advise the **Department** in writing of the actual date of **commencement**.
8. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans required by this approval, and make them available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.
9. By 31 December of each year after the **commencement** of the action, the person taking the action must publish a report on their website addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plans as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the **Department** at the same time as the compliance report is published.
10. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the commencement of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.

11. If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans as specified in the conditions, the person taking the action must submit to the department for the **Minister's** written approval a revised version of that plan. The varied activity shall not commence until the **Minister** has approved the varied plan in writing. The **Minister** will not approve a varied plan unless the revised plan would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised plan, that plan must be implemented in place of the plan originally approved.
12. If the **Minister** believes that it is necessary or convenient for the better protection of World Heritage properties or National Heritage places to do so, the **Minister** may request that the person taking the action make specified revisions to the plans specified in the conditions and submit the revised plans for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved plans must be implemented. Unless the **Minister** has approved the revised plans then the person taking the action must continue to implement the plans originally approved.
13. If, at any time after five years from the date of this approval, the person taking the action has not substantially commenced the action, then the person taking the action must not substantially commence the action without the written agreement of the **Minister**.
14. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all plans referred to in these conditions of approval on their website. Each plan must be published on the website within 1 month of being approved.



## **Definitions**

**Department:** The Australian Government Department administering the *Environment Protection and Biodiversity Conservation Act 1999*.

**Minister:** The Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* and includes a delegate of the Minister.

**Construction:** Includes any preparatory works required to be undertaken including clearing vegetation, the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for buildings or infrastructure.

**Commencement:** The construction of any infrastructure, excluding fences and signage, associated with the proposed action.

# Project Approval

## Section 75J of the *Environmental Planning and Assessment Act 1979*

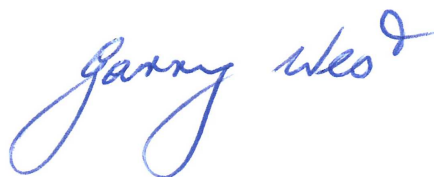
As delegate of the Minister for Planning and Infrastructure under delegation executed on 14 September 2011, we the Planning Assessment Commission of New South Wales (the Commission) approve the application referred to in Schedule 1, subject to the conditions in Schedules 2 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the Project.



Member of the Commission



Member of the Commission

Sydney 4 July 2012

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### SCHEDULE 1

<b>Application No:</b>	<b>06_0220</b>
<b>Proponent:</b>	Armidale Dumaresq Council
<b>Approval Authority:</b>	Minister for Planning
<b>Land:</b>	Part lots 1 and 2 DP 253346 and Part lot 1 DP820271
<b>Project:</b>	Armidale Regional Landfill

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## SCHEDULE 2

### DEFINITIONS

BCA	Building Code of Australia
CMA	Catchment Management Authority
Construction	The demolition of buildings or works, carrying out of works and erection of buildings and other infrastructure covered by this approval
Council	Armidale Dumaresq Council
Day	The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
DECCW	former Dept of Environment, Climate Change and Water
Department	Department of Planning and Infrastructure
Director-General	Director-General of the Department (or delegate)
EA	Environmental assessment titled Armidale Regional Landfill Environmental assessment (April 2010) and the associated Submissions Report 12 April 2011.
EPA	Environment Protection Authority of OEH
EP&A Act	Environmental Planning & Assessment Act 1979
EP&A Regulation	Environmental Planning & Assessment Regulation 2000
EPL	Environmental Protection Licence
Evening	The period from 6pm to 10pm
Feasible	Feasible relates to engineering considerations and what is practical to build
Incident	An incident causing or threatening material harm to the environment, and/or an exceedance of the limits or performance criteria in this approval
Land	In general, the definition of land is consistent with the definition in the EP&A Act.
LEMP	Landfill Environmental Management Plan
Harm to the environment	Harm to the environment involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
Minister	Minister for Planning and Infrastructure
Mitigation	Activities associated with reducing the impacts of the Project
Night	The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
NOW	NSW Office of Water
OEH	Office of Environment and Heritage including the EPA
Operation	The receipt of waste on site and the conduct of waste related operations such as waste compaction, intermediate waste covering and landfill cell capping.
POEO Act	Protection of the Environment Operations Act 1997
Privately-owned Land	Land not owned by the Proponent or where a private agreement does not exist between the Proponent and the land owner
Project	The development described in the EA
Proponent	Armidale Dumaresq Council, or its successor
Reasonable	Reasonable relates to the application of judgment in arriving at a decision, taking into account: mitigation benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
Rehabilitation	The treatment or management of land disturbed by the project for the purpose of establishing a safe, stable and non-polluting environment
RTA	Roads and Traffic Authority
Site	The land described in Schedule 1
Statement of Commitments	The Proponent's Statement of Commitments in APPENDIX A

## SCHEDULE 3

### ADMINISTRATIVE CONDITIONS

#### OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

1. The Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or decommissioning of the Project.

#### TERMS OF APPROVAL

2. The Proponent shall carry out the Project generally in accordance with the:
  - a) EA;
  - b) statement of commitments (see APPENDIX A);
  - c) site layout plans and drawings in the EA, (as shown in APPENDIX B); and
  - d) conditions of this approval.
3. If there is any inconsistency between the above documents specified in condition 2, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.
4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
  - a) any reports, plans, strategies, programs or correspondence that are submitted in accordance with this approval; and
  - b) the implementation of any actions or measures contained in these reports, plans, strategies, programs or correspondence.

#### LIMITS OF APPROVAL

5. The Proponent shall not exceed the maximum volume for each land-fill cell specified in Table 1. Calculation of the cell-volume shall include the cell cap and intermediate non-waste layers but shall not include the leachate barrier, leachate drainage layer or the re-compacted clay liner at the base of the cell.

Table 1 - Maximum volume for each landfill cell

Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
211,000m <sup>3</sup>	211,000m <sup>3</sup>	211,000m <sup>3</sup>	211,000m <sup>3</sup>	211,000m <sup>3</sup>

6. The Proponent shall prepare and submit a waste management performance review for the project. The review must:
  - a) be prepared by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be submitted to the Director- General at least 12 months before the proposed commencement of each additional landfill cell;
  - c) report on Council's progress in meeting current waste avoidance and resource recovery targets; and
  - d) recommend necessary measures or actions to improve Council's waste avoidance and resource recovery performance to meet current targets.

*Note: The Proponent may submit the report in conjunction with the Annual Review under Condition 4 of Schedule 5 or the Independent Environmental Audit under Condition 8 of Schedule 5.*

#### STRUCTURAL ADEQUACY

7. The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures are constructed in accordance with the relevant requirements of the BCA.  
*Note: Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for the proposed building works.*

#### SUBDIVISION

8. Before commencing any work on the site, the Proponent shall register a new lot with the Land and Property Information Centre as generally described by the red out-line shown on the site layout in APPENDIX B.

## **PROTECTION OF PUBLIC INFRASTRUCTURE**

9. The Proponent shall:
- a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the Project; and
  - b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the Project.

## **OPERATION OF PLANT AND EQUIPMENT**

10. The Proponent shall ensure that all plant and equipment used for the Project is:
- a) maintained in a proper and efficient condition; and
  - b) operated in a proper and efficient manner.

## **STAGED SUBMISSION OF PLANS OR PROGRAMS**

11. With the approval of the Director-General, the Proponent may submit any plan or program required by this approval on a progressive basis.

## **COMPLIANCE**

12. The Proponent must assess and manage project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in Schedule 4. Any exceedance of these criteria and/or performance measures constitutes a breach of this approval and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Proponent must, at the earliest opportunity:
- a) take all reasonable and feasible steps to bring the operation back into compliance;
  - b) ensure that the exceedance does not recur;
  - c) consider all reasonable and feasible options for remediation (where relevant) and how to prevent a recurrence and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
  - d) implement remediation and prevention measures as directed by the Director-General,
- to the satisfaction of the Director-General.

## **SCHEDULE 4**

### **SPECIFIC ENVIRONMENTAL CONDITIONS**

#### **WASTE MANAGEMENT**

##### **Restrictions on Receipt of Waste**

1. The Proponent shall only receive waste on site that is authorised for receipt by an EPL.

#### **LANDFILL OPERATION**

##### **Cover Material**

2. The Proponent shall ensure that all waste cover material used on site is virgin excavated natural material and/or alternative daily cover, as approved in writing by the OEH.

##### **Security**

3. The Proponent shall:
  - a) install and maintain a perimeter fence and security gates;
  - b) ensure that the security gates are locked whenever the site is unattended.

#### **SOIL AND WATER**

##### **Discharge Limits**

4. The Proponent shall ensure that all surface water discharges from the site comply with the:
  - a) discharge limits (both volume and quality) set for the development in any EPL; or
  - b) relevant provisions of the POEO Act.

##### **Leachate Containment System**

5. Each landfill cell must be constructed with a leachate barrier that:
  - a) is designed in consultation with OEH and to the satisfaction of the Director General;
  - b) addresses dispersive soil in the A2 and B soil horizons;
  - c) includes:
    - a re-compacted clay liner or similar material at least 90 centimetres thick with an in-situ co-efficient of permeability of less than  $10^{-9}$  metres per second covering the entire floor and walls of each waste disposal cell;
    - a flexible membrane liner stabilised against or protected from ultra violet light with a minimum co-efficient of permeability of less than  $10^{-14}$  metres per second covering the entire floor and walls of each waste disposal cell;
    - a leachate drainage layer for each landfill cell comprising a minimum 300mm layer of drainage medium:
      - with a permeability of not less than  $1 \times 10^{-3}$  metres per second;
      - which is chemically resistant to leachate;
      - which is capable of withstanding the weight of overlying waste;
6. The leachate collection, conveyance and storage system must:
  - a) be designed in consultation with the OEH and to the satisfaction of the Director General;
  - b) be designed to address dispersive soil in the A2 and B soil horizons;
  - c) not include leachate discharge or disposal except by way of:
    - evaporation;
    - irrigation on to an active landfill cell;
    - re-injection into an active or capped landfill cell;
    - transport to a facility licensed to accept such waste;
  - d) include a leachate storage dam that has a minimum leachate storage capacity of 12 megalitres.
7. The leachate storage dam must:
  - a) be designed in consultation with the OEH and to the satisfaction of the Director General
  - b) be designed to address dispersive soil in the A2 and B soil horizons;
  - c) allow for the level of leachate in the storage dam to be maintained such that there is no overflow
  - d) be designed to contain a 100-year ARI 3 day rainfall event and provide 150mm freeboard for wave action, providing a total storage capacity of 14.6ML.
  - e) include high-level alarm and/or interlock system configured such that the alarm is activated and any pump or gravity flow of leachate to the dam is automatically shut down prior to dam overflow.
  - f) Include a leachate barrier comprising:

- a re-compacted clay or similar material at least 90 centimetres thick with an in situ co-efficient of permeability of less than  $10^{-9}$  metres per second covering the entire floor and walls of the dam/s;
- a flexible membrane liner stabilised against or protected from ultra violet light with a minimum co-efficient of permeability of less than  $10^{-14}$  metres per second covering the entire floor and walls of the dam/s.

### **Construction Quality Assurance Plan**

8. The Proponent shall prepare and implement a Construction Quality Assurance Plan. The plan must:
  - a) be prepared in consultation with OEH by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by Director General prior the commencement of construction;
  - c) specify leachate-barrier material selection and construction techniques;
  - d) include a geotechnical assessment and map of suitable construction clay;
  - e) specify validation of thickness and permeability of leachate barrier/s;
  - f) include an environmental-awareness site-induction for construction personnel.

*Note: The geotechnical assessment and map must be more detailed than the assessment and map in the EA.*

### **Leachate Management Plan**

9. The Proponent shall prepare and implement a Leachate Management Plan. The plan must:
  - a) be prepared in consultation with OEH and NOW by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by Director General prior to the commencement of construction;
  - c) include a water balance for the Project;
  - d) include design specifications for the leachate containment system (see conditions 5, 6 and 7 of this schedule);
  - e) include design specifications that address dispersive soil in the A2 and B soil horizons;
  - f) include a ground and surface water monitoring plan for the site in consultation with NOW. The plan shall include details on:
    - the number, design and location for the monitoring bores, including upstream groundwater bore/s for baseline data collection;
    - timelines for establishment and sampling regime(s) for the monitoring bores;
    - monitoring frequency, including monitoring during rainfall;
    - a schedule of contaminants to be monitored; and
    - reporting requirements for the sampling results.
  - The plan must be submitted to the Director-General within 6 months of the date of this approval and be endorsed by NOW before submission.
  - The Proponent shall install the baseline monitoring bore and implement the baseline monitoring sampling program before commencing construction of the landfill.
  - The Proponent shall implement the approved ground and surface water monitoring plan to the satisfaction of the Director-General.
  - g) ensure all surface waters are directed away from the leachate containment system;
  - h) ensure all lateral flows in the A2 soil horizon are directed away from the leachate containment system.
  - i) ensure any water that contacts waste or leachate is handled as leachate;
  - j) include remedial action plan should leachate escape the leachate containment system.

### **Stormwater Management**

10. Stormwater infrastructure must installed to the satisfaction of the Director General: The design must:
  - a) be prepared in consultation with NOW and OEH and to the satisfaction of the Director General;
  - b) be approved by Director General prior to the commencement of construction;
  - c) direct clean water in overland flow around operational parts of the site;
  - d) prevent cross-contamination of clean or sediment laden water with leachate;
  - e) direct all sediment laden water in overland flow
    - away from the leachate containment system;
    - to a sediment basin with capacity for a 5 day 95<sup>th</sup> percentile storm with a minimum storage capacity of 5250m<sup>3</sup>.
  - f) include a dry detention basin below the operational parts of the site with capacity for a 100 year ARI 3 day rainfall event with a minimum storage capacity of 30ML;
  - g) address stormwater run-off from ancillary parts of the site such as the access road.
11. The proponent shall manage the sediment basin so that it maintains capacity to store run-off from the 5 day 95th percentile storm.



## Soil and Water Management Plan

12. The Proponent shall prepare and implement a soil and water management plan. The plan must:
- be prepared in consultation with the OEH and NOW by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - be approved by Director General prior to the commencement of construction;
  - include design specifications for stormwater infrastructure (see conditions 10 and 11 of this schedule);
  - include design specifications for erosion and sediment control to:
    - minimise erosion and soil-loss;
    - set aside any topsoil in manner appropriate for re-use in site rehabilitation;
    - minimise the tracking of mud and waste by vehicles onto public roads.
  - address the environmental and structural risks of dispersive soils in the A2 and B soil horizons;
  - ensure that watercourse and natural drainage lines maintain natural hydrological flows and geomorphic integrity;
  - address any Harvestable Right Order that might apply;
  - specify work methods within riparian areas and drainage lines in accordance with the *Guidelines for Controlled Activities 2008*.

## Bunding

13. The Proponent shall store all chemicals, fuels and oils used on site in appropriately bunded areas, with impervious flooring and sufficient capacity to contain 110% of the largest container stored within the bund, unless double-skinned tanks are used. Any bunds shall be designed and installed in accordance with the requirements of all relevant *Australian Standards*, and/or EPA's *Environmental Protection Manual: Technical Bulletin Bunding and Spill Management*.

## Wastewater Management

14. The Proponent shall ensure that:
- The on-site waste water treatment system for staff amenities and vehicle-wash is operated in accordance with an approval under section 68 of the *Local Government Act 1993*.
  - the design of the system is consistent with Council's DCP (if applicable).

## NOISE

### Operating Hours

15. The Proponent shall comply with the operating hours in Table 2.

Table 2 - Operating Hours

Activity	Day	Hours
Construction	Monday - Friday	7 am – 5 pm
	Saturday	8 am – 1 pm
	Any other time	Only with the prior written approval of OEH and subject to any conditions that may be imposed.
Operation	Monday - Friday	7 am – 5.30 pm
	Saturday	8 am – 6 pm
	Any other time	Only during an emergency. The details of any such incident must be reported in accordance with schedule 5, condition 6.

## Noise Limits

16. The Proponent shall ensure that the noise generated by the project does not exceed the emission limits in Table 3.

Table 3 - Noise emission limits dB(A)

Receiver	Limit -
Residences on privately-owned land during construction	LA <sub>eq(15 minute)</sub> 40dB(A)
Residences on privately-owned land during operations	LA <sub>eq(15 minute)</sub> 35dB(A)
Residence on privately owned land known as 'Sherraloy' during operation of cell 1 only	LA <sub>eq(15 minute)</sub> 38dB(A)

### Notes:

- LA<sub>eq (15 minute)</sub> is the level of noise equivalent to the average of noise levels occurring over the measured period (i.e. 15 minutes).
- For the purpose of noise measures required for this condition, the LA<sub>eq</sub> noise level must be measured or computed at any point within 30 metres of any residence not on the premises over a period of 15 minutes

using "FAST" response on the sound level meter. Where it can be demonstrated that direct measurement at such a location is impractical, an alternative means of determining compliance under Chapter 11 of the NSW Industrial Noise Policy may be acceptable.

- Modification factors in Section 4 of the NSW Industrial Noise Policy apply to the measured noise levels.
- The noise emission limits apply under all meteorological conditions except during rain and wind speeds greater than 3m/s at 10m height; and under "non-significant weather conditions". Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

17. Before operation commences a noise-easement must be registered on the title of the residual lot containing the dwelling on the farm 'Sherraloy' allowing the noise criteria as specified in condition 16 of this Schedule.
18. The Proponent must prepare and implement a Noise Management Plan (NMP) prior to commencement of operation that covers all premises based activities and transport operations. The plan must:
  - a) be prepared in consultation with the OEH by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by the Director-General prior to the commencement of construction;
  - c) include a system that allows for periodic assessment of Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) that has the potential to minimise noise levels from the facility;
  - d) specify effective implementation of identified BMP and BATEA measures, where considered feasible and reasonable;
  - e) include a program for monitoring the noise impacts of the project including real time noise monitors to measure noise emissions during operation;
  - f) include measures to record and respond to complaints;
  - g) include measures for community consultation including site contact details;
  - h) include specifications and protocols for the installation and relocation of mobile noise barriers; and
  - i) describe mitigation measures that would be implemented in the event that a non-compliance is identified with the noise impact assessment criteria in this approval.

## **AIR QUALITY**

### **Dust**

19. All operations and activities occurring at the premises or on a haulage route must be carried out in a manner that will minimise emissions of dust.
20. Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

### **Odour**

21. The Proponent shall not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act.

### **Greenhouse Gas**

22. The Proponent shall implement all reasonable and feasible measures to minimise:
  - a) greenhouse gas emissions;
  - b) energy use.
23. The Proponent shall prepare and implement a Greenhouse Gas Management Plan in consultation with the OEH and to the satisfaction of the Director-General prior to commencement of operations.

### **Air Quality Monitoring Plan**

24. The Proponent shall prepare and implement an Air Quality Monitoring Plan in consultation with the OEH and to the satisfaction of the Director-General prior to the commencement of operations.

### **Meteorological Monitoring**

25. During the life of the project, the Proponent shall ensure that there is a suitable meteorological station in the vicinity of the site that complies with the requirements in the latest version of Approved Methods for Sampling of Air Pollutants in New South Wales guideline.

## BIODIVERSITY CONSERVATION

### Biodiversity Offset Package

26. A biodiversity offset package must be implemented to the satisfaction of the Director General. The package must generally conform to Biodiversity Offset Management Plan in the EA prepared by EA Systems (17 February 2010) and include:
- a) the offset areas mapped in the diagram at APPENDIX E;
  - b) ongoing monitoring and review for effectiveness;
  - c) security in perpetuity to the satisfaction of OEH.

### Conservation Management Plan

27. The Proponent shall prepare and implement a Conservation Management Plan. The plan must:
- a) be prepared in consultation with the CMA and OEH, by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by Director General prior to the commencement of construction;
  - c) generally conform with the recommendations in the Flora and Fauna Assessment in the EA prepared by EA Systems (17 February 2010)
  - d) include detailed specifications for the biodiversity offset package;
  - e) specify minimum qualifications for any person involved in biodiversity management;
  - f) specify a protocol for tree removal. The protocol must include:
    - a construction schedule showing progressive tree removal to the minimum extent necessary;
    - a prohibition on the use of loud or heavy machinery within 100m of the 2009 Little Eagle nest tree during breeding season (August to January);
    - tree tagging for significant trees that can be retained. Significant trees include:
      - individual stands of *Eucalyptus nicholii*;
      - hollow bearing or known habitat trees or stags;
      - individual stands within a critically endangered ecological community.
    - supervision of any tree removal by a suitably qualified person;
  - g) specify Koala management for the site access;
  - h) specify a protocol for isolated finds of Aboriginal artefacts;
  - i) specify any necessary ongoing management measures.

## VISUAL AMENITY

### Landscaping

28. The proponent shall ensure landscaping and revegetation screens the operational parts of the landfill from Waterfall Way as much as practical and to the satisfaction of the Director General. Any landscaping must be consistent with the Biodiversity Offset Package or Biodiversity Management Plan.

### Lighting

29. The Proponent shall ensure that the lighting associated with the project:
- a) complies with the latest version of AS 4282(INT) - *Control of Obtrusive Effects of Outdoor Lighting*; and
  - b) is mounted, screened and directed in such a manner that it does not create a nuisance to surrounding properties or the public road network.

### Signage

30. The Proponent shall not install any advertising signs on site without the written approval of the Director-General.

## TRAFFIC AND TRANSPORT

### Access Road Work and parking

31. Prior to the commencement of operation the Proponent shall carry out the following work to the satisfaction of the Director General:
- a) construct an AUSTROADS modified BAR treatment to 100km/h standard at the site entrance on Waterfall Way generally in accordance with the diagram in APPENDIX D so through traffic can safely negotiate right-turning vehicles;
  - b) construct an AUSTROADS BAL treatment at the site entrance on Waterfall Way;
  - c) install warning signs and road markings in accordance with RTA requirements;
  - d) provide an entry gate on the access road that is sufficiently distant from the site entry to allow the largest vehicle to stand clear of the public roadway while waiting to enter the site;
  - e) construct and seal an access road from Waterfall Way to the wheel wash facility;

- f) construct a culvert over the affected drainage line/s to allow vehicular access to the landfill during a 1 in 100 year flood event.
- g) construct parking for staff in accordance with *AS 2890 Parking Facilities*.

*Note: Any work on Waterfall Way will require a Works Authorisation Deed from the RTA.*

#### **Transport Code of Conduct**

- 32. The Proponent shall prepare and implement a Transport Code of Conduct for the project to the satisfaction of the Director-General. This code must:
  - a) be prepared in consultation with the RTA by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by the Director-General prior to the commencement of operation;
  - c) describe the measures to be implemented to minimise the impacts of the Project on the local and regional road network, including traffic noise.

**SCHEDULE 5**  
**ENVIRONMENTAL MANAGEMENT, REPORTING & AUDITING**

**ENVIRONMENTAL MANAGEMENT**

**Construction Management Plan**

1. The Proponent shall prepare and implement a Construction Management Plan for the development to be carried out to the satisfaction of the Director-General. The Plan must be approved by the Director General prior to the commencement of work.

**Landfill Environmental Management Plan**

2. The Proponent shall prepare and implement a Landfill Environmental Management Plan for the Project to the satisfaction of the Director-General. This plan must:
  - a) be prepared by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by the Director-General prior to commencement of operation;
  - c) include detailed baseline data;
  - d) incorporate management plans and programs required by this approval;
  - e) address the Benchmark Techniques in Appendix 1 of *Environmental Guidelines for Solid Waste Landfills (1996, Environment Protection Authority)* and the conditions of this approval;
  - f) describe:
    - statutory requirements (including any approval, licence or lease conditions);
    - any limits or performance criteria; and
    - specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the Project or any management measures;
  - a) include a protocol for managing and reporting any:
    - incidents;
    - non-compliances with statutory requirements; and
    - exceedances of the relevant limits and/or performance measures / criteria; and
  - g) include a protocol to:
    - inform the local community and relevant agencies about the operation and environmental performance of the project;
    - receive, handle, respond to, and record complaints;
    - resolve any disputes that may arise during the course of the project; and
    - respond to emergencies; and
  - h) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project.
  - i) include a contingency plan to manage any unpredicted impacts and their consequences;
  - j) include a protocol for periodic review of the plan.
  - k) include a program to monitor and report on the impacts and environmental performance of the Project and the effectiveness of any management measures; and
  - l) include a program to investigate and implement ways to improve the environmental performance of the Project over time.

**Closure and Rehabilitation**

3. The Proponent shall prepare and implement a landfill closure and site rehabilitation plan. The plan must:
  - a) be prepared in consultation with OEH by a suitably qualified and experienced expert whose appointment has been endorsed by the Director-General;
  - b) be approved by the Director General prior to the commencement of operation;
  - c) describe the final landform generally in accordance with the final landform diagram in APPENDIX C;
  - d) ensure the site including capped landfill cells are equivalent to Class 4 agricultural land under the Agricultural Land Suitability Classification guideline;
  - e) include post-closure monitoring of ground and surface waters; and
  - f) include post-closure monitoring of leachate.

**Annual Review**

4. One year after the commencement of operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:
  - a) describe the operations that were carried out in the past year;
  - b) analyse the monitoring results and complaints records of the Project over the past year, which includes a comparison of these results against the:
    - relevant statutory requirements, limits or performance measures/criteria;

- monitoring results of previous years; and
  - relevant predictions in the EA;
- c) Corroboration of leachate and stormwater monitoring results with modelled conditions;
  - d) identify any trends in the monitoring data over the life of the Project; and
  - e) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance; and
  - f) describe what measure will be implemented over the next year to improve the environmental performance of the Project.

### **Revision of Plans & Programs**

5. Within 3 months of the submission of an:
  - a) annual review under condition 4 of SCHEDULE 5;
  - b) incident report under condition 6 of SCHEDULE 5;
  - c) independent environmental audit under condition 8 of SCHEDULE 5,

the Proponent shall review, and if necessary revise the plans and programs required under this approval to the satisfaction of the Director-General.

*Note: This is to ensure the plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the Project.*

### **REPORTING**

#### **Incident**

6. Upon detecting an exceedance of the limits/performance criteria in this approval or the occurrence of an incident that causes (or may cause) material harm to the environment, the Proponent shall immediately (or as soon as practical thereafter) notify the Department and other relevant agencies of the exceedance/incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

#### **Regular**

7. The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval, and to the satisfaction of the Director-General.

### **INDEPENDENT ENVIRONMENTAL AUDIT**

8. Within a year of the commencement of operations of the project, and every 3 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
  - a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
  - b) include consultation with the relevant agencies;
  - c) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant EPL (including any plan or program required under these approvals);
  - d) review the adequacy of any plans or programs required under these approvals; and, if appropriate;
  - e) recommend measures or actions to improve the environmental performance of the project, and/or any plan or program required under these approvals.

*Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.*

9. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Proponent shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

### **ACCESS TO INFORMATION**

10. From the commencement of the construction of the project, the Proponent shall make the following information publicly available on its website as it is progressively required by the approval:
  - a) a copy of all current statutory approvals;
  - b) a copy of the current plans and programs required under this approval;
  - c) a summary of the monitoring results of the Project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
  - d) a complaints register, which is to be updated on a monthly basis;

- e) a copy of the Annual Reviews (over the last 5 years);
- f) a copy of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit; and
- g) any other matter required by the Director-General.



## APPENDIX A

### STATEMENT OF COMMITMENTS

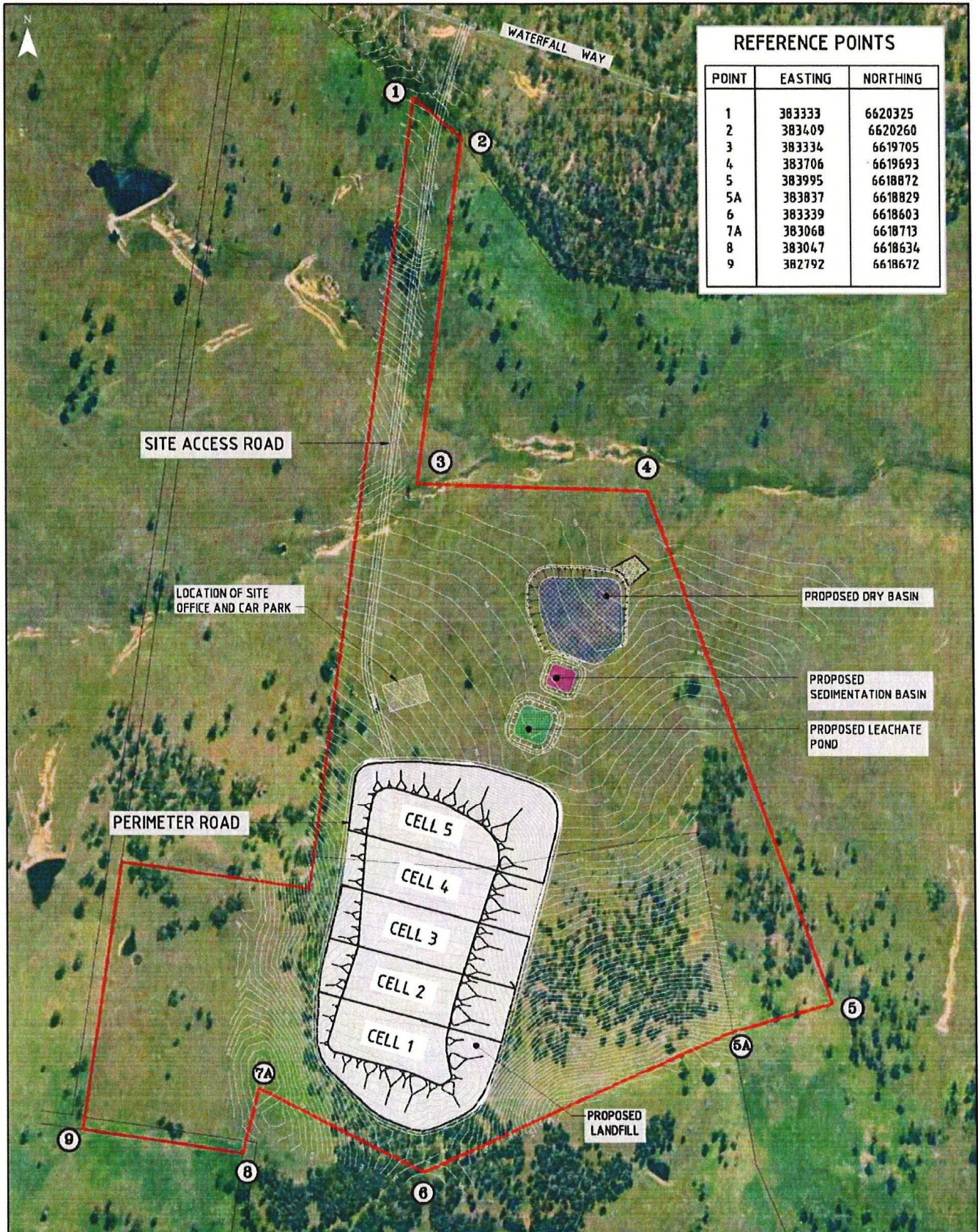
Commitments
<p><b>General Commitments</b></p> <ol style="list-style-type: none"> <li>1. The Proponent will undertake the activities, the subject of the Project Approval in accordance with the general descriptions and details provided in the EA, including the mitigation and management measures identified in the EA.</li> <li>2. The Proponent will gain all necessary approvals and permits supporting both construction and operation.</li> <li>3. The Proponent will prepare and implement the following management plans for the project: <ul style="list-style-type: none"> <li>- A LEMP and associated sub-plans; and</li> <li>- A Biodiversity Offset Management Plan</li> </ul> </li> <li>4. The Proponent will ensure that the final design landfill footprint of the proposed landfill facility is determined in consideration of relevant environmental constraints with a view to minimising the potential impacts of the proposal.</li> </ol>
<p><b>Landform and Soils</b></p> <ol style="list-style-type: none"> <li>5. The Proponent will implement an Erosion and Sediment Control Plan as part of the LEMP.</li> </ol>
<p><b>Geology</b></p> <ol style="list-style-type: none"> <li>6. The Proponent will undertake investigations of the potential geological fault during construction and will then undertake further detailed assessment if evidence of a geological fault is encountered.</li> </ol>
<p><b>Surface Water</b></p> <ol style="list-style-type: none"> <li>7. The Proponent will implement a WLMP as part of the LEMP.</li> <li>8. The Proponent will adopt the Water Sensitive Urban Drainage (WSUD) principles in the design criteria for the control and treatment of drainage runoff.</li> <li>9. The Proponent will ensure all leachate produced is monitored in accordance with the proposed landfill facility's licensing arrangements under the <i>POEO Act</i>.</li> <li>10. The Proponent will ensure that monitoring is undertaken as detailed in the Water Quality Monitoring Program and Management Plan.</li> </ol>
<p><b>Groundwater</b></p> <ol style="list-style-type: none"> <li>11. The Proponent will implement a Leachate Management System as part of the LEMP and designed in accordance with the relevant <i>Landfill Guidelines Benchmark Techniques</i>.</li> <li>12. The Proponent will implement a WLMP.</li> <li>13. The Proponent will ensure that monitoring is undertaken as detailed in the Water Quality Monitoring Program and Management Plan and in accordance with an EPL.</li> </ol>
<p><b>Air Quality</b></p> <ol style="list-style-type: none"> <li>14. The Proponent will ensure that air quality management practices identified in the EA will be included in the LEMP.</li> </ol>
<p><b>Greenhouse Gas</b></p> <ol style="list-style-type: none"> <li>15. The Proponent will undertake a regular review of the viability of retro fitting the landfill with alternative landfill gas management techniques.</li> </ol>
<p><b>Noise</b></p> <ol style="list-style-type: none"> <li>16. As part of the LEMP, the Proponent will prepare a Construction Noise Management Plan in accordance with the relevant <i>DECCW Guidelines</i>.</li> </ol>

Commitments
<p>Biodiversity Issues</p> <p>17. The Proponent will ensure that the LEMP contains appropriate measures to avoid or reduce secondary/downstream impacts on biodiversity. The LEMP will include the following management sub plans:</p> <ul style="list-style-type: none"> <li>- Native Fauna Management Plan</li> <li>- Fire Management Plan</li> <li>- Pest Management Plan</li> <li>- Disease Monitoring Protocol</li> </ul> <p>18. The Proponent will adhere to the mitigation measures identified in the Biodiversity Offset Management Plan.</p>
<p>Socio-Economic</p> <p>19. The Proponent will undertake community consultation as identified in the EA.</p>
<p>Indigenous Heritage</p> <p>20. The Proponent will prepare and implement an Indigenous Heritage Management Plan.</p> <p>21. The Proponent will fence off and avoid significant Aboriginal heritage sites.</p>
<p>National Environmental Heritage</p> <p>22. The Proponent will implement a WLMP to appropriately manage both surface water and leachate during the operational life of the landfill.</p>
<p>Land Use</p> <p>23. The Proponent will build a cattle grid into the access road.</p> <p>24. The Proponent will ensure grazing stock do not enter the landfill area.</p>
<p>Traffic and Transport</p> <p>25. The Proponent will upgrade the T-junction intersection on Waterfall Way.</p>
<p>Hazards</p> <p>26. The Proponent will ensure relevant Materials Safety Data Sheets, spill containment and safety equipment is installed at the proposed landfill facility.</p> <p>27. The Proponent will ensure the proposed landfill facility is fenced to prevent vandalism.</p> <p>28. The Proponent will monitor landfill gas accumulation.</p> <p>29. The Proponent will prepare and implement an Emergency Response Plan for fire protection, flood hazards, and OH&amp;S practices.</p>
<p>Visual</p> <p>30. The Proponent will provide vegetation screening of the landfill facility using plantings of species endemic to the local area.</p> <p>31. The Proponent will maintain all vegetation outside the landfill footprint but within the boundaries of the Project Site for the life of the landfill.</p>
<p>Climate Change</p> <p>32. The Proponent will allow a freeboard in the design of the landfill dry basin (that captures overflows from the leachate pond and sedimentation basin) to capture the 100 year storm event.</p> <p>33. The Proponent will implement and adhere to the mitigation measures identified in the Biodiversity Offset Management Plan.</p>



## APPENDIX B

### LAYOUT OF THE PROJECT SITE



ARMIDALE DUMARESQ COUNCIL - ARMIDALE REGIONAL LANDFILL FACILITY  
INDICATIVE SITE LAYOUT PLAN

Source: AECOM (2008)

FEB 2010  
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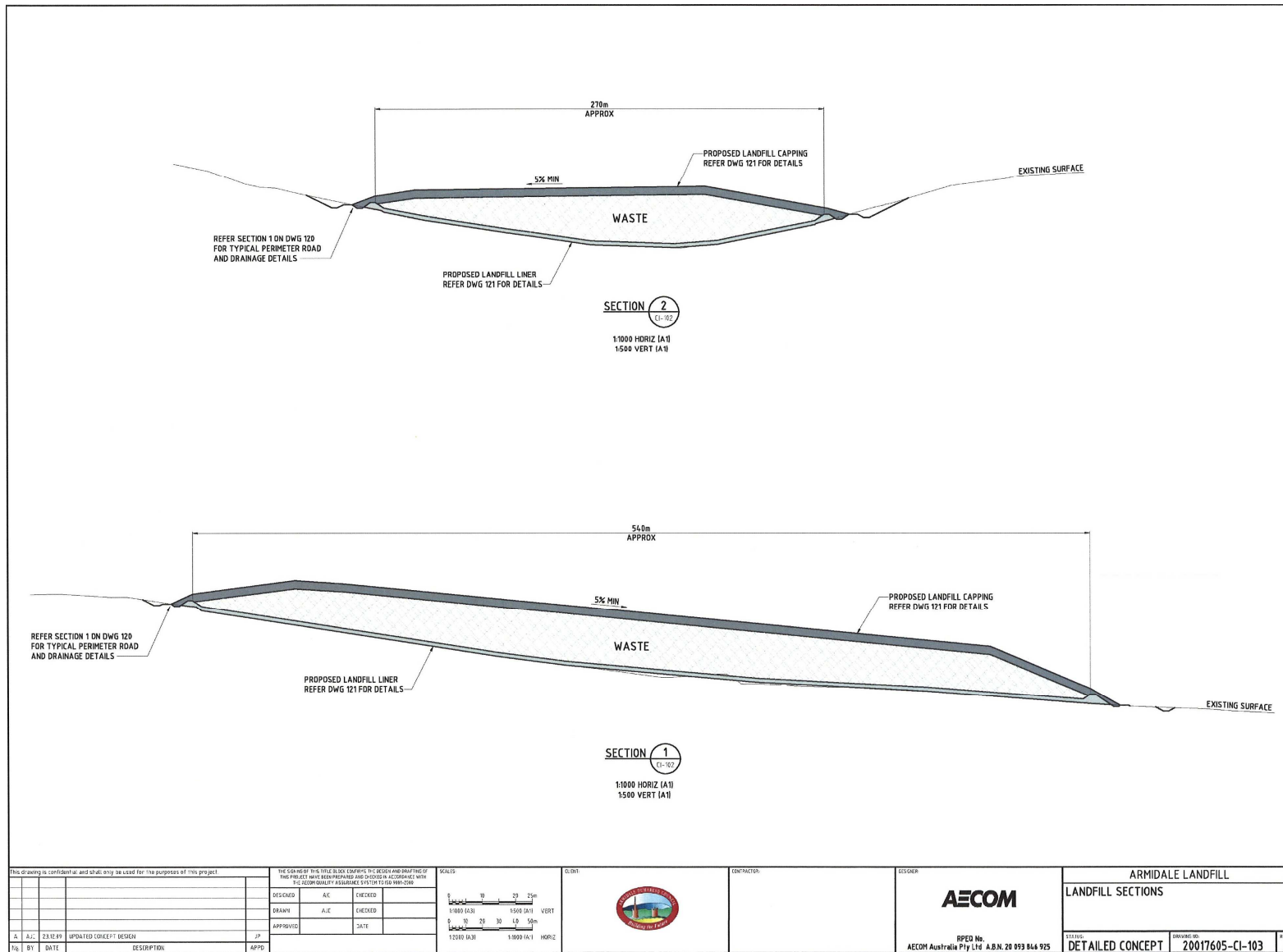
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Fig 6



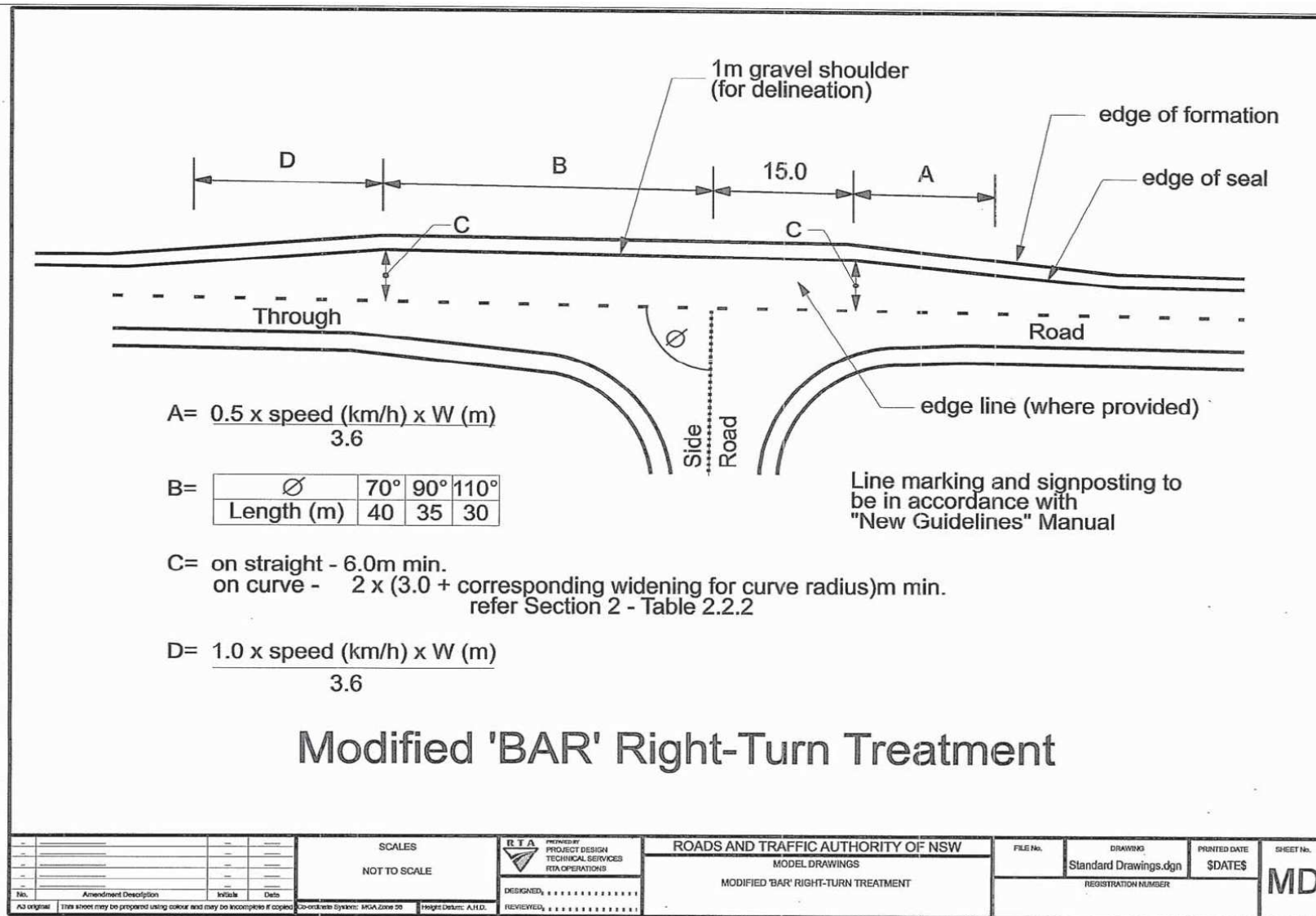
## APPENDIX C

### INDICATIVE FINAL LANDFORM OF LANDFILL AREA



## APPENDIX D

### INDICATIVE JUNCTION DESIGN





## APPENDIX E

### BIODIVERSITY OFFSET DIAGRAM



## **Appendix B. Vegetation Management Plan**



~ Commercial-in-Confidence ~

# Vegetation Management Plan & Vegetation Clearing Protocol

**Armidale Landfill, Waterfall Way**

Report Number 23464.62561



*Prepared for*

*by*

**AECOM<sup>®</sup>**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

# Document Status Record

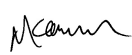



Report Type: Vegetation Management Plan & Vegetation Clearing Protocol

Project Title: Armidale Landfill, Waterfall Way

Client: AECOM Pty Ltd

Project.Document reference: 23464.62561

File Name: 23464.62561\_140804\_AECOM\_Armidale Landfill Vegetation Management Plan\_Rev0

Revision	Date of Issue	Author	Checked	Quality Assurance	Approved
A	24/05/2013	Jessica Wait	Michaela Bobeck	Jay Westfold	Tas Larnach
B	03/07/2014	Mark Kawun		Helen Rhule	Mark Kawun
0	13/08/2014	Mark Kawun	Simon Lott	Jenni Lott	Simon Lott
<b>Signatures</b>					

**Notes:**

**Rev A:** Draft report (for comment)

**Rev B:** Draft final report (for comment)

**Rev 0:** Final report

**Distribution:**
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## 1. Introduction

This document outlines the Vegetation Management Plan for the approved Armidale Regional Landfill situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Ltd for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This plan details measures for revegetation, rehabilitation and landscaping works to be undertaken during construction, operation and post-operation of the landfill site. The plan also includes details of actions to assist natural regeneration in areas where a viable natural seed bank is likely to exist.

This plan aims to encourage best practice environmental management in agreement with the principles of ecologically sustainable development.

This plan was a recommendation of the Flora and Fauna Assessment prepared by EA Systems (17 February 2010) and under the Project Approval (PAC NSW, 2012) Section 75J of the Environmental Planning and Assessment Act 1979 is required to be included in the Conservation Management Plan (CMP). This management plan is part of the *Biodiversity Management Plan* (document reference 22678.38513), which in turn forms of the CMP.

### 1.1 Objective

The objective of this Vegetation Management Plan is to prevent and minimise adverse impacts on native flora, habitat quality and ecological communities. Adverse impacts upon native flora may result from clearing, construction and operation of a landfill and include fragmentation, loss of habitat, weed invasion, and pollution. Such disturbances reduce the habitat quality and may threaten viable populations of threatened species found within the landfill site and surrounding area.

### 1.2 Document Review

This Vegetation Management Plan shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan will include complaints, incidents, monitoring data and the results of any external audit and inspection.

### 1.3 Document Requirements

The requirement of the plan is stated in the Flora and Fauna Assessment prepared by EA Systems (17 February 2010) and stipulates that a vegetation management plan will be put into place to maintain and enhance biodiversity values of the site and to minimise adverse impacts on threatened flora and fauna. This plan provides for the following:

- Minimising the extent of clearing;
- Avoiding clearing areas not immediately required for operational purposes;
- Planting for landscaping and vegetated buffers using locally occurring native species;
- The maintenance of adequate ground cover on all parts of the landfill site not required for day-to-day operations;
- Progressive rehabilitation and revegetation of spent landfill areas;
- Revegetation along fringe proposed water storages to encourage use by native mammal, reptile, amphibian and bird species;

- Ongoing monitoring of condition of native vegetation in areas likely to be impacted by the proposed development including revegetated areas;
- Ongoing monitoring and follow-up control of weeds and pests that establish on disturbed areas, with particular attention to the eradication of noxious weeds and pests identified as Key Threatening Processes such as rabbits and foxes.

## 2. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 1.

**Table 1:** Roles and responsibilities

Role	Responsibilities
Waste Manager	<ul style="list-style-type: none"> <li>Responsible and accountable for the overall environmental performance of landfill site and the implementation of this plan;</li> <li>Commit to and lead a positive environmental management culture and challenge 'at-risk behaviour';</li> <li>Regularly communicate expectations and ensure workers and others understand and comply with this plan;</li> <li>Undertake the annual review of this document; and</li> <li>Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>Responsible for the implementation of this plan; and</li> <li>Conduct monthly site inspections to monitor environmental performance and compliance with this plan.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>Responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan on a day-to-day basis (general integrity of the site);</li> <li>Understand and actively participate in a positive environmental management culture;</li> <li>Identify improvements or initiatives for environmental management; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>

### 2.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training will be retained with Council for a minimum of five years.

### 3. Implementation of Control Measures

#### 3.1 Vegetation Clearing

The extent of vegetation clearing shall be minimised wherever possible. Areas which are not immediately required for operational purposes will not be cleared until necessary. This means that vegetation within landfill cells 4 and 5 should not be cleared until at least 30 and 40 years respectively, after operation of the landfill has commenced.

The number of mature trees requiring removal within proposed landfill areas will be limited to the minimum necessary for the safe construction and use of the proposed development (including for water management and fencing). Mature trees to be retained will be marked to ensure machinery operators take due care in their vicinity and minimise any damage that may otherwise occur.

Vegetation clearing procedures are detailed in the Section 4. Vegetation Clearing Protocol.

#### 3.2 Establishment of Offset Areas

Vegetation offsets shall be developed at a 3:1 ratio of offset to impact area (i.e. three times more revegetated area than the area quarantined for landfilling purposes). Offset areas will protect and allow regeneration of approximately 61 ha of land within the overall development area, in accordance with the *Biodiversity Offset Management Plan* (BOMP)(document reference 22678.38513).

A 3:1 offset to impact ratio will result in an area of 40 ha of Stringybark Woodland, containing individual Yellow Box and Blakely's Red Gum trees, which will be set aside and managed for conservation to compensate for woodland lost to development. The Stringybark Woodland offset areas will be adjacent to the landfill operational area and are part of an existing remnant of Stringybark Woodland that contains Yellow Box and Blakely's Red Gum trees. Furthermore, an offset area of 21 ha of cleared grasslands within the subject site will be set aside for conservation. The locations of the offset areas are illustrated in **Error! Reference source not found.**

The grassland offset area will be revegetated with trees and shrubs as part of the screening process and to enhance connectivity between the Travelling Stock Route (TSR) and the Stringybark woodland. It would be appropriate to strategically locate these revegetated areas between the landfill footprint and any significantly impacted viewpoints, to mitigate the visual impacts upon nearby residences as well as publically accessible vantage points along Waterfall Way.

Furthermore, areas to the west of the landfill pit shall be rehabilitated to provide a linkage to woodland remnants within 600 m of the site. Fencing of the area, which contains some existing Stringybark trees, will allow for a degree of natural regeneration. However, planting of additional trees in the southern portion of this area will likely be required to achieve adequate regeneration of the offset area.

A vegetation buffer will be developed along the access road to create a corridor connecting the offset area to the TSR and the Gara Remnant Subregional Corridor. The access road buffer area shall be a minimum of 100 m wide to provide a suitable dispersal area for fauna.

A Property Vegetation Plan (PVP) is an appropriate/supported way forward to protect the offset area. A PVP would aim to provide a formal long-term commitment to manage parts of private properties for conservation purposes. It is intended that any government funding and support received through this initiative will be spent on maintaining and improving the biodiversity



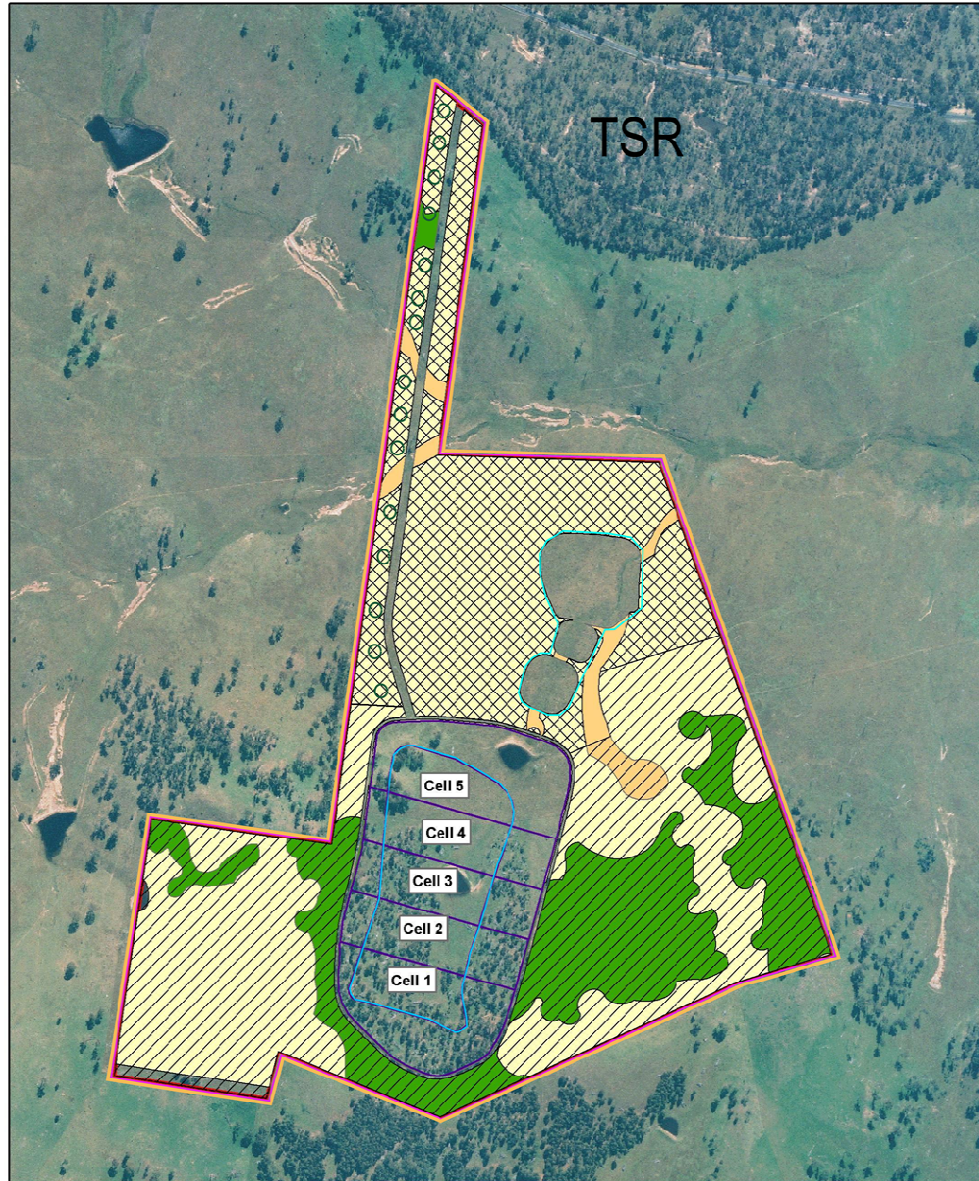
offset areas, particularly those areas characterised by the endangered ecological community Box-Gum Woodland. An important outcome of the formalisation of a PVP on the land is that the management of the biodiversity offset area will become intergenerational, as the agreement is legally binding on all current and future landholders.

### **3.3 Buffers and Firebreaks**











Vegetated buffers will be constructed along the access road and a firebreak buffer around the landfill pit and infrastructure areas (within the offset areas and outside the landfill cell fencing)(refer to Figure 1). These areas will be established in the early stages of project construction, and removal of existing vegetation from the landfill pit will be delayed as long as possible to achieve maximal overlap.

Native trees and shrubs within buffers will be planted in a configuration to mimic the natural landscape and will occupy the maximum width of the road corridor. Planted buffer areas will be maintained by a suitably qualified person for a period of 24 months. During this period any trees that die will be replaced and additional seeding undertaken if required.

Furthermore, a firebreak shall be constructed around the perimeter of the offset areas (refer to Figure 1).



### Legend

	Stringybark Woodland Offset Area		Fire Break
	Grassland Offset Area		Offset Perimeter Fence
	Existing Grassland		Landfill Active Cell Fence
	Existing Sedgeland		Landfill Management Operations Fence
	Existing Stringybark Woodland		
	Proposed Landfill Boundary		
	Indicative Vegetation Screening		

0 125 250 500 750 Meters



**Figure 1.** Location of firebreaks, fences and offset areas for the approved landfill facility.

Note 1: Location of landfill active cell fence and landfill management operations fence may change dependent on detailed design for the site.

Note 2: The landfill active cell fence will be dynamic and the area it surrounds will change based on active cells.

### 3.4 Rehabilitation and Revegetation

Rehabilitation and revegetation is to occur in all disturbed areas. Disturbed areas will be revegetated to achieve a C-factor of less than 0.05 (70% ground cover or more) within 60 days of establishment.

Spent landfill cells are to be progressively revegetated in order to stabilise soils and restore the landscape to a form that is compatible and comparable with its pre-existing vegetation type. Final capped areas will be revegetated with shallow-rooted native grasses, shrubs and trees (shallow rooted or if approved for phytocapping) complementary to the existing surrounding Stringybark woodland community.

Rehabilitation and revegetation measures also include establishment of offset areas. Furthermore, revegetation areas will also be located between isolated established remnant patches of woodland to act as stepping stones for native fauna populations.

Revegetation of grassland areas shall resemble a continuation of either the stringy bark woodland communities or the box-gum woodland communities. Plantings must be non-uniform in nature and provide vertical stratification for native fauna. To ensure this, a diverse selection of suitable native species must be planted.

All revegetation works will be undertaken by appropriate personnel and supervised by a qualified ecologist. Revegetation works will include a 2 year maintenance period to ensure grasses and plants have been effectively established.

Management of the landfill area will be adaptive depending on the responses of native flora and fauna to rehabilitation and management actions. Unforeseen changes in conditions may result in minor adaptations to management actions in order to improve the chances of favourable outcomes from year to year.

#### 3.4.1 Native Seed Procurement

Pre-clearing collection of locally sourced seeds for direct seeding and/or propagation of tubestock will be undertaken in spring/summer prior to commencement of works. Before collecting seed, consultation must be made with the relevant authorities to establish what permits and licences are required. Seeds should only be collected when they are mature. Seeds and saplings will be taken from the landfill pit area or from the vicinity of the intended revegetation areas, and either immediately replanted in the proposed offset areas or, in the case of seeds, stored for future replanting of spent cells within the landfill pit area. Storage of native seeds must be undertaken appropriately to maintain the viability of the seed. Ideally, seeds shall be replaced before their viability falls below 85% of the initial value (Australian National Botanic Gardens, 2013).

The selection of species for revegetation purposes will differ depending on which vegetation community the area aims to resemble. A species list has been developed for each community, based on a species list generated from flora surveys conducted by EA Systems (2010a), in conjunction with the Office of Environment and Heritage vegetation community descriptions. Species lists for each community are presented in Annex 1.

If tubestock and seed have to be procured from external sources, species shall be sourced from local nurseries, such as the Armidale Tree Group Native Nursery.

### 3.4.2 Planting of Native Trees and Shrubs

Advice on how to plant shrubs and trees shall be sought from the environmental officer. General management measures include the following:

- Planting and sowing shall be undertaken during periods when the soil temperature is greater than 15°C;
- Spacing will be determined according to the species, but will typically be 2 m apart for most tree species; and
- Tubestock will be watered immediately following planting.

Planting in rows and planting of monotypic tubestock will be avoided (Munro et al. 2009). Fine-scale patchiness can be developed by spacing trees and shrubs at irregular distances and by not planting in straight rows. Thinning of smaller, immature trees in areas of dense regrowth shall be conducted in accordance with the BOMP (document reference 22678.38513). Thinning trees assists biodiversity by returning a forest system to a natural structure more rapidly than is possible through natural attrition.

### 3.4.3 Seeding of Native Groundcover

Direct seeding will be used to establish shallow-rooted native grasses and herbs. The seed mixture will comprise the most common grasses currently present on the site, including Slender Rat's Tail Grass (*Sporobolus creber*), Red-leg Grass (*Bothriochloa macra*), Rough Speargrass (*Austrostipa scabra*), Couch (*Cynodon dactylon*), Snow Grass (*Poa sieberiana*), Small Lovegrass (*Eragrostis leptostachya*), Purple Wiregrass (*Aristida ramosa*) and Slender Wallaby Grass (*Austrodanthonia racemosa*).

To reduce ant predation, seeds should be treated with 'Coopex' or other suitable residual insecticide prior to application. If seeds have been stored apart from topsoil for a long period, they should also be treated with root-nodule bacteria (rhizobia).

Given the relatively mesic environment of the Armidale area, mulch will not be required and its use will be avoided. Application of water will most likely be required to ensure effective establishment and germination. Newly established pastures must not be disturbed, as this will cause a substantial reduction in plant establishment.

### 3.4.4 Natural Regeneration

Natural regeneration is to occur in the offset woodland areas where there is a known seed bank held within soils. Specifically this includes areas throughout the TSR, the TSR access route, the grassland offset area, the Waterfall Way turning lane and the Stringybark Woodland area. Natural regeneration shall only occur in areas where the topsoil, which contains roots, seeds and other vegetative propagules, is not removed, or if removed and stockpiled, is respread before the soil seed bank declines. As such, natural regeneration will only be solely relied upon in areas where vegetation is required to be removed for construction, but soil does not need to be removed. Furthermore, root stocks will be left in the ground where practicable to facilitate rapid regrowth and soil stabilisation.

If understorey regeneration is not satisfactory in natural regeneration areas after one year, selected replanting of shrubs and saplings will be necessary in treeless gaps throughout the Stringybark Woodland.

### ***3.4.5 Structural Complexity***

Natural layers of structural complexity and patchiness of vegetation must be re-established in the offset areas through a mixture of plant species regrowth. Layers of vegetation can be established by selecting plants that grow to different heights, such as trees, tall shrubs, low shrubs and groundcover. Fine-scale patchiness can be developed by spacing trees and shrubs at irregular distances and by not planting in straight rows. In the long term, management of blocks of vegetation by thinning can be used to enhance patchiness. Structural complexity shall also be achieved by not removing groundcover elements, such as fallen logs and debris.

Furthermore, the following habitat requirements must be considered for successful establishment of structural complexity within offset areas:

- The Diamond Firetail (*Stagonopleura guttata*) builds bottle-shaped nests in trees and bushes, but largely forages on the ground for grass seeds and insects. This species will require well-established overstorey, shrubs and groundcover to successfully inhabit the offset area;
- The Speckled Warbler (*Chthonicola sagittata*) nests and forages on the ground for arthropods and seeds in grassy patches, leaf litter and shrub cover. The successful assessment of groundcover and a shrub layer is important for the survival of this species. However, more important for the survival of this species are the removal of existing introduced predators on the site (such as foxes and cats). Speckled Warblers may respond well to replanted eucalypt woodlands;
- Varied Sittellas (*Daphoenositta chrysoptera*) forage socially on insects, by clambering among tree branches and probing bark and dead wood. The successful established and retention of mature trees on the site is paramount to the survival of this species;
- Scarlet Robins (*Petroica boodang*) forage on insects, mostly by pouncing to the ground from a low perch. A well-established groundcover layer and tree canopy are required for the survival of this species;
- The Little Eagle (*Hieraaetus morphnoides*) pair on the site will move to a new nest location when: a) their nestling has fledged and disturbance near the nest/roost tree increases; and b) the number of rabbits, their primary food source on the site, is reduced. Provided that several large mature trees, such as Yellow Boxes, are retained on the site the Little Eagles will not be significantly impacted by the development. Refer to *Native Fauna Management Plan* (document reference 23464.62576) for instructions related to Little Eagle management.

The establishment of shrubs, such as native Acacias (preferably bipinnate) and a shrubby understorey, in the offset woodland shall be considered to reduce the number of Noisy Miners (*Manorina melanocephala*).

### 3.5 Soil Management

#### 3.5.1 Soil Stripping

Topsoil removed from within the landfill pit area must be salvaged and retained for subsequent revegetation. Topsoil is generally referred to as horizon O and A. Horizon O is the highest horizon consisting of almost entirely organic matter and contains barely any mineral matter. The A horizon is found below the O horizon and is the horizon where humus has decayed further and mixed with mineral grains (clay, silt and sand). The depth of topsoil may vary from only 20 mm to around 100 mm or more. If the topsoil horizon cannot be identified, the top 100-300 mm of soil shall be recovered and considered topsoil. The topsoil stripping depth must be confirmed with the environmental officer.

Soil material will be stripped in a slightly moist condition (neither too wet nor too dry), as this may cause compaction, loss of structure, and loss of viability of seeds and mycorrhizal inoculum. This may require stripping activities to be rescheduled to a period of suitable conditions or the application of water. The combination of a scraper, grader, front-end loader, truck and bulldozer may be used for the removal, transport and spreading of soil in order to reduce compaction.

#### 3.5.2 Stockpiling

Different soil horizons (zones) shall be stockpiled separately (i.e. topsoil stockpiled separately from subsoil), with a separation distance to ensure they are not mixed during other clearing,

construction or revegetation activities. Stored topsoil shall be stockpiled to a maximum height of 2 m and revegetated to minimise the risk of erosion, as well as to discourage weeds and maintain active populations of beneficial soil microbes. Stockpiles shall have a maximum C-factor of 0.1 (60% ground cover or more) within 10 days of construction, using native grass species which have the ability to establish and germinate quickly. Stockpiles must be monitored for weeds to prevent establishment and spreading.

Additional control measure to be considered include:

- Spraying of stockpile with surface sealants and/or water spray carts to keep surface moist rather than wet;
- Stockpiles be covered with impervious cover (where practical); and
- Other erosion and sedimentation control listed in Section 4.9.

Stockpiled topsoil shall not be excessively handled, as this will deteriorate the soil structure. Therefore, topsoil shall be placed as close to its source as possible, but also where it will not be disturbed by other activities. Stockpiles must not be placed in flood-prone areas, or closer than 2 m from hazard areas such as concentrated water flows, existing vegetation and fence lines. Furthermore, stockpiles must be located at least 40 m away from any riparian lands. Designated stockpiling areas will be established prior to commencing clearing activities.

### 3.5.3 Soil Re-spreading

The combination of a grader, front-end loader, truck and bulldozer may be used for the removal, transport and spreading of soil in order to reduce compaction. Re-spreading of topsoil shall only take place following reinstatement and compaction of subsoil. Prior to re-spreading topsoil the ground surface shall be ripped to assist with binding of the soil layers, increase retention time of water on slopes, aid water infiltration into the soil profile, increase the opportunity for seed germination and reduce the amount and velocity of run-off generated. Topsoil stockpiled for extended periods will be turned over and mixed prior to replacement. However, this is only required if thorough mixing is unlikely to occur during re-spreading. Topsoil shall be replaced evenly to all disturbed surfaces within the revegetation area and applied to pre-disturbance depths or to at least 100 mm. After the topsoil has been re-spread, the surface may be lightly scarified to minimise compaction. Scarification will be completed prior to seeding and must ensure no subsoil is ripped to the surface. Revegetation activities and soil re-spreading shall be avoided during periods of high erosive rainfall events.

To re-establish sustainable native vegetation on the spent landfill cells, the rehabilitation will commence with landform design and the reconstruction of a stable land surface prior to replacing the topsoil.

### 3.5.4 Topsoil Amelioration

Amelioration of topsoil may be required prior to revegetation and shall be discussed with the environmental officer. The stripped topsoil will be tested prior to reuse, as topsoil acidity may increase over time. The use of gypsum or lime may be required to amend the soil quality prior to application. Although native species are adapted to the low nutrient levels common in Australian soils, fertiliser application may improve growth and establishment. Application rates of inorganic fertilisers will be assessed according to the results of soil analysis and in consultation with the environmental officer.

Topsoil with a chloride level of above 800 mg/kg shall not be applied near the root zone, as high levels of chloride may adversely affect plant growth.

### **3.6 Relocation of Logs and Stags**

Hollow-bearing stags and log piles from within areas to be cleared will be relocated to offset areas as logs, to emulate natural conditions.

### **3.7 Fencing and Tree Guards**

Fences shall be constructed and maintained to exclude livestock and feral pest animals such as rabbits. Refer to the accompanying *Pest Management Plan* (document reference 23464.62586) for additional information and Annex 2 for species specific fencing requirements.

Tree guards may be required to protect the young plants from browsing.

### **3.8 Weed and Pest Management**

Ongoing monitoring and management of weeds and pests must be conducted in accordance with the *Weed Management Plan* (document reference 23464.62571) and *Pest Management Plan* (document reference 23464.62586).

Weed control will be ongoing during the construction, operation and rehabilitation of the landfill. Two comprehensive searches for weeds will be implemented each year, one in late spring (November) and another in late summer (February) as different weed species propagate at various times of the year.

### **3.9 Erosion and Sediment Control**

In general, establishment of vegetation limits erosion due to reduced sediment movement and run-off velocities. Vegetation also improves infiltration and protects the surface from raindrop impact. Hence, an adequate groundcover will be maintained where possible during all stages of the landfill development.

Temporary control measures, including sediment fencing, jute matting, geotextile and sandbags, shall be installed where required to ensure effective erosion and sediment control. Temporary controls must not be removed until the disturbed area has been adequately stabilised and rehabilitated. All surface water shall ultimately drain into stable, well grassed drainage lines or waterways.

Stockpiles of erodible material, such as topsoil, must have sediment fences installed on the downslope side to trap sediment from run-off, as well as an earth bank constructed on the upslope side to divert run-on water around stockpile.

Erosion and sediment controls must be installed and maintained in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and in consultation with the ADC Environmental Officer. Furthermore, runoff from the landfill area must not result in sedimentation and pollution of nearby land and waterways.



## 4. Vegetation Clearing Protocol

### 4.1 Procedure

#### 4.1.1 Delineate Vegetation to be Cleared

A survey to delineate the area of vegetation to be cleared by the use of pegs, fencing or flagging tape suitable to indicate a 'no clear zone'. Tagging for significant trees that can be retained will be conducted and will include the following trees:

- Individual stands of *Eucalyptus nicholii*;
- Mature trees that have been identified as containing Little Eagle (*Hieraaetus morphnoides*) nests;
- Hollow bearing or known habitat trees or stags; and
- Individual stands within a critically endangered ecological community.

Additionally, monitoring plots will be established in the offset area prior to vegetation removal for the landfill pit and infrastructure. Further information for the establishment of plots for ongoing vegetation monitoring can be found in Section 6.1 of the BOMP (document reference 22678.38513).

A clearing checklist is provided in Annex 3.

#### 4.1.2 Pre-clearing Inspection of Vegetation

The project ecologist/spotter catcher to check for the presence of fauna or active nests prior to felling the vegetation in each section. Any mammals or nests found will be relocated by the project ecologist/spotter catcher to the nearest similar habitat that will not be cleared.

A toolbox talk will be conducted to ensure clearing procedures are understood by all parties involved.

#### 4.1.3 Implement Environmental Control

Ensure all environmental controls are in place before removal of vegetation occurs, and where possible water is diverted to catch drains or sediment basins (refer to Annex 3 for checklist)

#### 4.1.4 Vegetation Removal

Site Supervisor/Waste Manager and project ecologist/environmental officer to walk clearing limits to ensure they are adequately delineated prior to clearing. Clearing will only be conducted in delineated area.

A two (2) stage approach to clearing will be implemented. Under-scrubbing (i.e. removing of ground vegetation and shrubs) and the removal of non-habitat/non-hollow trees will be undertaken prior to removal of over storey (trees). Non-hollow bearing trees will be cleared before habitat trees to allow fauna an opportunity to move from the hollow bearing trees and allow time to concentrate rescue efforts on the trees that are most likely be inhabited.

Hollow bearing trees will be felled after a minimum 24 hr delay after clearing of non-habitat trees. Prior to the felling of hollow-bearing trees, hollows must be checked for fauna habitation (refer to the 'spotter catcher' protocol in section 4.5.1 of the accompanying *Fauna Management Plan* (document reference: 23464.62576)).

The project ecologist/spotter catcher will be onsite for the felling of all hollow bearing trees.

Felled hollow bearing trees will be inspected as soon as possible by a suitable qualified person.

Felled trees will be left overnight or inspected by a suitable qualified person prior to further process.

Report any injured fauna to the project ecologist/spotter catcher.

Following felling, all logs and hollow-bearing trees must be relocated into the offset area as single logs (not piles as this will encourage rabbits). All logs which have a diameter >20 cm will be relocated into the offset areas following clearing.

#### ***4.1.5 Post-Clearing Inspection***

Post clearing inspections will be captured weekly to ensure protocol is being followed.

#### ***4.1.6 Reporting***

Following completion of clearing, the project ecologist or suitably qualified person will prepare a report that:

- Details the assessment of habitat trees and the handling of fauna affected;
- Details the clearing operations, including procedures, dates, areas and information on personnel involved with the clearing;
- Details any live animals that were sighted, captured and released, injured or shocked;
- Details dead animals that were found as a result of clearing operations and fauna rescue;
- Details trees being used for breeding or roosting by fauna, including their species, location, size, height and depth of hollows in trees; and
- Includes photo images of rescued fauna.

### **4.2 Construction/Clearing Near Trees**

The number of mature trees requiring removal within the project area will be limited to the minimum necessary for the safe construction and operation of the proposed development.

Mature trees to be retained will be marked to ensure machinery operators take due care in their vicinity and minimise any damage that may otherwise occur.

#### ***4.2.1 General activities around trees***

For all works to be conducted near vegetation to be retained, the following points will be observed:

- Prior to using an excavator or other machinery around trees, ensure damage to trunks, roots and branches is avoided by observing their location. Damage to tree trunks may result in future decay;
- Some branches can be tied back if they are obstructing work. This depends on the flexibility and strength of the tree. Contact the Site Supervisor/Waste Manager who will contact the Environmental Officer to undertake flexibility tests prior to tying back branches;
- If trimming is required report to Site Supervisor/Waste Manager who will engage an ecologist or arborist where deemed needed;
- Report any tree damage to the Site Supervisor/Waste Manager who will contact the Environmental Officer. Quick remedial action can usually prevent long term damage to a tree.

#### 4.2.2 Lopping/Pruning Trees

Heavy machinery will not be used for pruning or trimming. A suitably qualified person will be contacted. Appropriate tools to use are loppers, chain saws and vehicle mounted saws. In the first instance, limbs bearing hollows will be retained. If this is not possible the hollow bearing limb will be inspected by a 'Spotter Catcher' (see *Native Fauna Management Plan* (document reference 23464.62576) for more details).

#### 4.2.3 Excavation near Trees

Some construction work, particularly drainage, may be designed within close proximity to vegetation planned to be retained. To ensure roots are not damaged in a way that could detrimentally affect tree health the following points will be observed:

- Where possible, redesign drainage to avoid impact within the drip lines of retained vegetation;
- After set out of the works, consult with the environmental officer for advice prior to excavation;
- Excavation of machinery will occur outside the drip line of trees where possible;
- For necessary works within the drip line of trees and the Critical Root Zone (CRZ), the following techniques will be utilised:
  - Hand trenching/excavation to avoid machinery damage to roots;
  - Under boring; if underground pipes are to be installed.
- For all excavations near trees, proceed with caution and monitor for roots greater than 50mm in diameter. Roots greater than 50mm must not be damaged unless approved by a suitably qualified person following consultation with an ecologist or arborist. Larger roots may need to be cut by an arborist.

### 4.3 Fauna Considerations

#### 4.3.1 Threatened Species:

There has been a pair of nesting Little Eagles on site in the past. Their nest site has been identified in a large Yellow Box tree in the north-west of the landfill area (Pers.Com., Steve Debus). Before clearing, the area must be thoroughly inspected to determine whether or not the nest still exists. If it does still exist the following procedure must be undertaken:

- Remove the nest tree (if necessary) in the non-breeding season, after the fledgling has left the nest (February-July);
- Clear the development site in stages, gradually approaching the nest tree before the breeding season (August-January);
- Avoid highly disturbing activity (e.g. heavy machinery) within 100 m of the nest in the breeding season (August-January). If impractical, consult with ecologist for alternative solutions;
- Retain the 2009 nest tree and a surrounding 50 m buffer in the offset zone. If retention of the nest tree is impracticable, include a tree with similar characteristics (e.g. tall Yellow Box with mistletoes) in the offset zone.

If the nest no longer exists, the tree can be felled in accordance with Section 4.1.

#### 4.4 Beneficial Ecological Clearing

In areas of dense vegetation regrowth, low intensity thinning of dense stands of young trees can be applied, so long as it is considered to have ecological benefit. Draft guidelines are presented below in Table 2.

**Table 2:** Protocols for thinning of regrowth in offset areas

Category	Guidelines
1. Site selection	Thinning will be applied only to localised areas that are dominated by trees less than 15 cm in diameter at breast height (DBH). Thinning will not be applied to areas where basal area is less than 20 m <sup>2</sup> per ha.
2. Tree size	Only trees less than 15 cm DBH will be cut.
3. Area	A mosaic of thinning is required, with some areas left un-thinned across the landscape. Each thinning operation will be conducted within a defined site of no more than 2 ha.
4. Percent of area	To further guide the creation of a mosaic, within the 2 ha defined site not more than 50% of the area will be thinned, preferably as small plots of less than 900 m <sup>2</sup> (30x30 m).
5. Basal area target	Thinning will be designed so that remaining basal area in the thinned plots is greater than 20 m <sup>2</sup> .

## 5. Monitoring and Review

Site inspections shall be conducted annually to monitor environmental performance and compliance with the mitigation measures outlined in this plan. The site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this plan; and
- The date and persons involved in the monitoring process.

The Waste Manager is to ensure that appropriate corrective actions are taken within an appropriate time frame to allow for continued compliance with this management plan.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post-operation, in order to adequately assess environmental performance and compliance.

Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for vegetation management.

### 5.1 Vegetation Monitoring

In general terms, vegetation monitoring will consist of the establishment of monitoring plots in the designated offset area, prior to vegetation removal. This will be followed by ongoing annual monitoring of revegetation/regeneration, from these points, to determine the success rate of the management plan. Monitoring plots will be determined during a flora and faunal assessment that will be conducted prior to the clearing of any vegetation.

A report will be written annually detailing the following:

- Digital photos with GPS locations and aspect for each monitoring plot;
- Ground cover assessment;
- Tree and shrub diversity;
- Tree height for trees less than 10 cm in diameter (regeneration measure);
- Calculation of total number of species, total stems (20x50 m), and estimated stems per 5 ha for each plot;
- Fallen timber;
- Ground disturbance;
- Organic leaf litter coverage;
- Presence and estimated density of exotic weed species; and
- A discussion on the density and diversity of natural regeneration occurring in each plot.

Information from this report will be included in the Annual Environmental Monitoring Report (AEMR) required for the facility under its Environmental Protection License (EPL).

A comprehensive vegetation monitoring program including approach to methodology has been established and available for reference within the *Biodiversity Offset Management Plan* (document reference 22678.38513).

### 5.2 Vegetation Management Plan Review

This vegetation management plan shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan will include complaints, incidents, monitoring data and the results of any external audit and inspection.

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## 7. Annexes

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## **Annex 1. Recommended Species List for Revegetation**



Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<b>Trees</b>			
<i>Acacia filicifolia</i>	Fern-leaved Wattle	✓	✓
<i>Allocasuarina littoralis</i>	Black She-oak	✓	
<i>Banksia integrifolia</i> subsp. <i>monticola</i>	Banksia		✓
<i>Angophora floribunda</i>	Rough-barked Apple		✓
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	✓	✓
<i>Eucalyptus bridgesiana</i>	Apple-topped Box		✓
<i>Eucalyptus caliginosa</i>	New England Stringybark	✓	✓
<b><i>Eucalyptus elliptica</i></b>	Bendemeer White Gum		✓
<i>Eucalyptus melliodora</i>	Yellow Box	✓	✓
<b><i>Eucalyptus nicholii</i></b>	Narrow-leaved Black Peppermint		✓
<i>Exocarpus cuppresiformis</i>	Native Cherry		✓
<b>Shrubs</b>			
<i>Acacia dawsonii</i>	Poverty Wattle		✓
<i>Acacia ulicifolia</i>	Prickly Moses	✓	✓
<i>Bursariaspinnosa</i> subsp. <i>spinosa</i>	Blackthorn	✓	✓
<i>Cassinia laevis</i>	Cough Bush	✓	✓
<i>Cassinia quinquefaria</i>	Cough Bush	✓	✓
<i>Cryptandra amara</i>	Bitter Cryptandra		✓
<i>Cryptandra propinqua</i>	Cryptandra		✓
<i>Daviesia genistifolia</i>	Broom Bitter Pea	✓	✓
<i>Daviesia latifolia</i>	Broad-leaved Bitter Pea	✓	✓
<i>Dillwynia sieberi</i>	Spiny Parrot Pea		✓

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Grevillea juniperina</i>	Juniper-leaved Grevillea		✓
<i>Hibbertia linearis</i>	Guinea Flower	✓	
<i>Hibbertia obtusifolia</i>	Guinea Flower	✓	✓
<i>Hibbertia riparia</i>	Guinea Flower	✓	✓
<i>Hovea linearis</i>	Hovea		✓
<i>Indigofera australis</i>	Hill Indigo	✓	✓
<i>Jacksonia scoparia</i>	Dogwood	✓	✓
<i>Lespedeza juncea</i> subsp. <i>sericea</i>	Chinese Lespedeza		✓
<i>Lissanthe strigosa</i>	Peach Heath	✓	✓
<i>Maytenus silvestris</i>	Narrow-leaved Orangebark		✓
<i>Melichrus urceolatus</i>	Urn Heath		✓
<i>Olearia viscidula</i>	Sticky Daisy Bush		✓
<i>Phyllanthus virgatus</i>	Small Spurge	✓	
<i>Pimelea curviflora</i> var. <i>divergens</i>	Curved Riceflower	✓	✓
<i>Pultenaea microphylla</i>	Spreading Bush-Pea	✓	✓
<i>Rubus parvifolius</i>	Native Raspberry	✓	✓
<b>Vines/climbers</b>			
<i>Glycine clandestina</i>	Glycine	✓	✓
<i>Glycine tabacina</i>	Variable Glycine	✓	✓
<i>Hardenbergia violacea</i>	Purple Twining-Pea		✓
<b>Mistletoes</b>			
<i>Amyema miquelii</i>	Box Mistletoe		✓
<i>Amyema pendulum</i>	Drooping Mistletoe	✓	✓
<b>Grasses</b>			

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Aristida ramosa</i>	Purple Wiregrass	✓	✓
<i>Aristida vagans</i>	Wiregrass	✓	✓
<i>Austrodanthonia laevis</i>	Wallaby Grass	✓	✓
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Slender Wallaby Grass	✓	✓
<i>Austrodanthonia richardsonii</i>	Tall Speargrass	✓	✓
<i>Austrostipa rudis</i>	Rough Speargrass	✓	✓
<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Rough Spear -grass	✓	
<i>Bothriochloa decipiens</i>	Red-leg Grass	✓	
<i>Bothriochloa macra</i>	Red Grass	✓	✓
<i>Chloris ventricosa</i>	Tall Chloris	✓	
<i>Cymbopogon refractus</i>	Barbed-wire Grass	✓	✓
<i>Cynodon dactylon</i>	Couch	✓	
<i>Dichelachne micrantha</i>	Slender Plume Grass	✓	✓
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	Hedgehog Grass	✓	✓
<i>Elymus scaber</i>	Wheat Grass	✓	✓
<i>Eragrostis leptostachya</i>	Small Lovegrass	✓	✓
<i>Eragrostis molybdea</i>	Lovegrass	✓	✓
<i>Lachnagrostis avenaceus</i>	Blown Grass	✓	✓
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Meadow Rice Grass	✓	✓
<i>Panicum effusum</i>	Hairy Panic	✓	✓
<i>Paspalum distichum</i>	Water Couch	✓	
<i>Pennisetum allopecuroides</i>	Swamp Foxtail	✓	
<i>Poa sieberiana</i>	Snow Grass	✓	✓
<i>Sorghum leiocladum</i>	Native Sorghum	✓	✓

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Sporobolus creber</i>	Slender Rat's Tail Grass	✓	✓
<i>Themeda australis</i>	Kangaroo Grass	✓	✓
<b>Herbs</b>			
<i>Acaena ovina</i>	Sheep's Burr		✓
<i>Ajuga australis</i>	Austral Bugle		✓
<i>Asperula conferta</i>	Woodruff	✓	✓
<i>Brachycome nova-anglica</i>	New England Brachycome		✓
<i>Brunoniella australis</i>	Blue Trumpet		✓
<i>Bulbine bulbosa</i>	Bulbine Lily		✓
<i>Calotis cuneifolia</i>	Purple Burr-daisy	✓	✓
<i>Calotis lappulacea</i>	Tangled Burr-daisy	✓	
<i>Carex appressa</i>	Tall Sedge	✓	✓
<i>Carex breviculmis</i>	A Small Sedge		✓
<i>Centella asiatica</i>	Pennywort	✓	
<i>Centipeda minima</i>	Spreading Sneezeweed	✓	
<i>Cheilanthes distans</i>	Hairy Mulga Fern	✓	
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern	✓	✓
<i>Chrysocephalum apiculatum</i>	Clustered Everlasting	✓	✓
<i>Craspedia canens</i>	Grey Billy-buttons		✓
<i>Crassula sieberiana</i>	Australian Stonecrop		✓
<i>Cymbonotus lawsonianus</i>	Bear's Ear	✓	✓
<i>Cynoglossum australe</i>	Native forget-me-not		✓
<i>Cyperus gracilis</i>	Slender Sedge	✓	✓
<i>Cyperus lhotskyanus</i>	Sedge	✓	

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Cyperus sanguinolentus</i>	Sedge		✓
<i>Cyperus sphaeroideus</i>	Sedge	✓	✓
<i>Desmodium brachypodum</i>	Large Tick-trefoil	✓	✓
<i>Desmodium gunnii</i>	Tick-trefoil	✓	✓
<i>Desmodium varians</i>	Slender Tick-trefoil	✓	✓
<i>Dianella revoluta</i> var. <i>vinosa</i>	Flax Lily		✓
<i>Dichondra</i> sp. A	Kidney Weed	✓	✓
<i>Dipodium</i> sp.	Hyacinth Orchid		✓
<i>Diuris chrysantha</i>	Donkey Orchid		✓
<i>Elatine gratioloides</i>	Waterwort	✓	
<i>Eleocharis acuta</i>	Spikerush	✓	✓
<i>Euchiton sphaericus</i>	Cudweed	✓	✓
<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	✓	✓
<i>Geranium solanderi</i> var. <i>solanderi</i>	Native Geranium	✓	✓
<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	Ivy Goodenia	✓	✓
<i>Goodenia pinnatifida</i>	Goodenia	✓	✓
<i>Haloragis heterophylla</i>	Raspwort	✓	✓
<i>Hydrocotyle laxiflora</i>	Stinking pennywort		✓
<i>Hypericum gramineum</i>	Small St. John's Wort	✓	✓
<i>Hypolepis glandulifera</i>	Downy Ground-fern	✓	
<i>Isolepis</i> sp.	Small Clubrush	✓	✓
<i>Juncus filicaulis</i>	Rush		✓
<i>Juncus planifolius</i>	Broad Rush		✓
<i>Juncus</i> sp.	Rush	✓	✓

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Juncus usitatus</i>	Rush	✓	✓
<i>Leptorynchos squamatus</i>	Yellow Buttons		✓
<i>Lomandra filiformis</i>	Slender Mat-rush	✓	✓
<i>Lomandra longifolia</i>	Spiny Mat-rush		✓
<i>Mentha diemenica</i>	Pennyroyal	✓	✓
<i>Opercularia hispida</i>	Hairy Stinkweed		
Orchid - ground	unknown sp, rosette lvs		✓
<i>Oxalis exilis</i>	Soursob	✓	✓
<i>Pellaea falcata</i>	Sickle Fern	✓	
<i>Persicaria lapathifolia</i>	Knotweed	✓	
<i>Persicaria prostrata</i>	Spreading Knotweed	✓	✓
<i>Plantago gaudichaudii</i>	Slender Plantain		✓
<i>Podolepis</i> sp.	Copper Daisy		✓
<i>Poranthera microphylla</i>	A Euphorb		✓
<i>Ranunculus lappaceus</i>	Common Buttercup		✓
<i>Ranunculus pumilio</i>	Small Buttercup	✓	
<i>Rumex brownii</i>	Swamp Dock	✓	✓
<i>Scleranthus biflorus</i>	Knawel		✓
<i>Senecio gunnii</i>	A senecio		✓
<i>Stackhousia monogyna</i>	Creamy Candles	✓	✓
<i>Triptilodiscus pygmaeus</i>	Small Sunray	✓	
<i>Typha orientalis</i>	Broad-leaved Cumbungi		✓
<i>Veronica plebeia</i>	Trailing Speedwell		✓
<i>Viola betonicifolia</i>	Native Violet		✓

Scientific name	Common name	Study site/Stringy Bark Community	TSR/Box Woodland Community
<i>Vittadinia muelleri</i>	Dissected Fuzzweed		✓
<i>Vulpia bromoides</i>	Squirrel Tail Fescue		
<i>Wahlenbergia communis</i>	Bluebell	✓	✓
<b>Aquatic plants</b>			
<i>Ottelia ovalifolia</i>	Swamp Lily	✓	
<i>Vallisneria gigantea</i>	Ribbonweed	✓	

## **Annex 2.      Fencing Requirements for Pest Exclusion**



	<b>Foxes</b>	<b>Feral Cats</b>	<b>Rabbits</b>
<b>Jump height/minimum fence height</b>	Capable of jumping at least 1800 mm	Capable of jumping at least 1800 mm	Minimum fence height 900 mm – additional protection with higher fence
<b>Maximum mesh size</b>	Less than 80 mm (and possibly 70 mm) to exclude juveniles along with adults.	50 mm (less for kittens)	30mm
<b>Maximum gap size below fence</b>	None	None	None
<b>Digging ability</b>	Good	Unknown	Excellent
<b>Climbing ability</b>	Excellent	Excellent	Capable of climbing
<b>Reaction to electrification<sup>1</sup></b>	Deterred by electric shocks but may learn to avoid these	Variable response	Electric wires may deter rabbits from digging beneath the fences
<b>Optimal spacing between electric wires</b>	70–90 mm when offset from netting fences (preferably at the lower end of the range).	80 mm when offset from netting fences	N/A
<b>Other attributes</b>	Can chew through plastic mesh		Can chew through plastic mesh

(adapted from Long and Robley, 2000)

<sup>1</sup> Assuming sufficient contact is made resulting in the animals receiving an electrical shock

## **Annex 3.      Vegetation Clearing Checklist**

Clearing Checklist	Comments	Signoff	Date
Clearing area in accordance to project approval		Environmental Officer	
Clearing activities scheduled outside of periods of fauna breeding or hibernation			
Clearing area inspected: <ul style="list-style-type: none"> <li>Pegged?</li> <li>Fauna habitat present?</li> <li>Species/communities assessed?</li> <li>Ecologists required for pre-clearing, clearing and post clearing assessments?</li> </ul>			
Monitoring plots established?			
Any unexpected heritage (both aboriginal or historical)			
<b>Pre Clearing Assessment</b>			
Hollow bearing trees, hollow logs and other habitat feature to be located and recorded by GPS, marked in the field by marking paint or similar and data documented on field sheets.		Ecologist	
Evening/nocturnal surveys will be undertaken to gauge fauna activity.			
Threatened plant species identified.			
The presence of seed for collection and salvageable habitat resources identified.			
The presence of noxious weed identified.			
Soil stockpiling areas identified.			
Monitoring plots identified			
<b>Clearing Checklist</b>			
Prior to felling, each tree will be visually inspected for the presence of fauna and shaken			
Doze or excavator 'slow drop' tree			
Once on the ground, each hollow will be inspected, they will be captured and transported to either WIRES or a veterinary hospital. Other fauna captured but not requiring care will be released into the same habitat near the point of rescue.			
Hollow bearing trees will be left on the ground overnight.			
Stockpiling of soils in accordance with Vegetation Management Plan and Vegetation Clearing Protocol.			
Report based on the results of the pre-clearing, clearing and post clearing assessment. Report to go to OEH.		Environmental Officer	
<b>Clearing Area Management and Habitat Salvaged</b>			
Weed sprayed and area/quantity		Environmental Officer	
Seeds collected; species and weight			
Number of trees cleared and species			
Number of hollow bearing trees cleared			
Number of timber salvaged			
Number of Hollows salvaged			

## **Appendix C.      Weed Management Plan**

~ Commercial-in-Confidence ~

# Weed Management Plan

**Armida Regional Landfill, Waterfall Way**

Report Number 23464.62571



*Prepared for*

*by*

**AECOM®**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

# Document Status Record


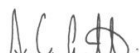

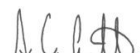
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<b>Signatures</b>					

**Notes:****Distribution:**

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This document provides information to address the intent of Project Number 23464 as agreed to by AECOM Pty Ltd.

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## **1. Introduction**

This document outlines the Weed Management Plan for the approved Armidale Regional Landfill facility situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Lt (EnviroAg) for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This Weed Management Plan details the mitigation measures for the prevention and control of weed infestations throughout the lifetime of the landfill, including the different stages such as construction, operation and decommissioning.

This Weed Management Plan aims to encourage best practice environmental management in agreement with the principles of ecological sustainable development.

The Weed Management Plan is a requirement of the Project Approval for the landfill (PAC NSW, 2012) under Section 75J of the Environmental Planning and Assessment Act 1979.

### **1.1 Objective**

The objective of this weed management plan is to prevent and minimise the spread of weeds within the landfill site and to adjacent areas of native vegetation.

### **1.2 Document Review**

This Weed Management Plan shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan will include complaints, incidents, monitoring data and the results of any external audit and inspection.

## 2. Identified Potential Impacts

The presence of noxious and invasive species of weeds has the potential to impact on the biodiversity of the proposed site through successful competition with native flora and through providing a harbour for pest animals. With competition, suppression of native flora can occur, placing more pressure on already threatened species. Invasive weed species such as blackberries provide good cover for pest animals, which have the potential to endanger local native fauna. Identified potential areas of impact include competition with native flora and fauna in the TSR and throughout the offset areas.

Weeds have the potential to change the fuel or litter characteristics of a site, thereby altering the fire regime and also affecting the suitability of the habitat for frogs, reptiles, birds and mammals. Weeds may also prevent recruitment of previously dominant species including trees (Parkes et al. 2003).

The establishment of weeds around the area may also have the potential to spread into the Oxley Wild Rivers National Park through the spreading of seeds from fruit eating birds and other animals. Further spread of weeds may be contributed to soil disturbances, earthworks and vegetation clearing during construction and rehabilitation phases of the landfill (EA Systems, 2010).

The potential for weed propagation from offsite will also be an issue for concern. Vehicular movements during the operations may be a carrier of seeds. Offsite soils introduced to the site during the construction phase may also be a harbour for seeds and mitigation measures must therefore be in place to prevent seed establishment.

Of the introduced species identified around the surrounding area, one (1) was identified, Blackberry (*Rubus fruticosus*), as being a noxious weed under the *Noxious Weeds Act 1993* for the Armidale Dumaresq Local Government Area (LGA).

According to the *Noxious Weeds Act 1993* noxious weeds are defined as “*plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area*” (Noxious Weeds Act, 1993 (NSW) s. 8).

The Act also states that “*A public authority that is an occupier of land to which a weed control order applies must control noxious weeds on the land as required under the order, to the extent necessary to prevent the weeds from spreading to adjoining land*” (Noxious Weeds Act, 1993 (NSW) s. 13). This means that the Armidale Dumaresq Council are legislated to control all noxious weeds identified onsite. Therefore priority is given to the mitigation and control of the identified species above.

Other invasive exotic grasses that may be introduced also have the potential to impact on the biodiversity of the site. Weeds from surrounding areas have the potential to be spread into the area and further on into the Oxley Rivers National Park. Such weeds include Coolatai grass (*Hyparrhenia hirta*), Serrated Tussock (*Nassella trichotoma*) and Chilean Needle grass (*Nassella neesiana*) (EA Systems, 2010). Of these three, Chilean Needle grass and Serrated Tussock are both declared noxious weeds in the Northern Tablelands and are regarded as ‘weeds of national significance’. Coolatai grass is considered a noxious weed in Southern NSW. Additionally, although not considered noxious in the Armidale Dumaresq LGA, other invasive exotic flora were identified and include: African lovegrass (*Eragrostis curvula*), Bathurst Burr (*Xanthium spinosum*), and Sweet Briar.

It is possible for illegally imported species to be introduced to the landfill through general waste. Although these species may not be on official listings, these species can pose a weed and plant pathogen risk. As such, it is critical that an individual with relevant experience conduct the

monthly surveys. Continual monitoring of weeds and potential infestations must be considered a priority to ensure the safety and health of the biodiversity of the surrounding area.

### 3. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 1.

**Table 1:** Roles and responsibilities

<b>Role</b>	<b>Responsibilities</b>
Waste Manager	<ul style="list-style-type: none"> <li>• Responsible and accountable for the overall environmental performance of the landfill site and the implementation of this plan;</li> <li>• Commit to and lead a positive environmental management culture and challenge ‘at-risk behaviour’;</li> <li>• Regularly communicate expectations and ensure workers and others understand and comply with this plan;</li> <li>• Undertake the annual review of this document; and</li> <li>• Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan.</li> </ul>
Superintendent /Environmental Officer	<ul style="list-style-type: none"> <li>• Responsible for the implementation of this plan; and</li> <li>• Conduct monthly site inspections to monitor environmental performance and compliance with this plan.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>• Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>• Understand and actively participate in a positive environmental management culture;</li> <li>• Identify improvements or initiatives for environmental management; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>• Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>

#### 3.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

## 4. Implementation of Controls

The Weed Management Plan is to provide a framework for the control and mitigation of targeted and noxious weeds. The framework will include the coordination of different methods of control to successfully and effectively manage invasive weed species.

### 4.1 Prevention

The most successful control measure for weed management is prevention. Prevention can be achieved through good hygiene practices and continual monitoring and understanding of classified noxious weeds that are critical to the Northern Tablelands. The most effective preventative methods include the following:

- Vehicle wash down area;
- Effective drainage and runoff systems; and
- Controlled use of top soils.

#### 4.1.1 Vehicle Wash Down (Wheel Wash Area)

Vehicle wash down is a standard control method to decrease the chances of spread through removal of weeds and seeds attached to incoming vehicles (AECOM, 2010). A vehicle wash down (wheel wash) area shall be established at the entrance to the site. All incoming vehicles will be washed down to prevent the possible spread of noxious weeds. The wash down area shall be designed to allow for capture, containment and drainage of contaminated water and prevent any water from escaping during heavy rainfall. Weed material contained in the wash down area shall be disposed of appropriately.

#### 4.1.2 Runoff and Drainage Systems

Effective drainage of surface water runoff will help capture and prevent the spread of seeds. Drainage systems shall be designed around and along the landfill boundary fence. Runoff shall be captured in the sedimentation ponds to prevent the off-site propagation of any waterborne seeds and weeds (AECOM, 2010).

#### 4.1.3 Topsoil Management

Topsoil has the potential to be a carrier for seeds and vegetative propagation material of weed species. To minimise the spread of weeds, the following management measures will be applied:

- Inactive stockpiles will be fertilised to maintain soil fertility and seeded with native species as soon as possible to increase the native seed bank, aid in erosion control and help prevent weeds
- Long-term stockpiling (ie. stockpiling for more than 6 months) will be stabilised with permanent native vegetation and possible barrier systems to control erosion and weeds;
- Topsoil stockpiles shall be continually monitored and identified weed infestations controlled;
- Importation of topsoil shall be limited, where possible; and
- Imported material for the construction/operation of the landfill must be virgin excavated natural material (not including topsoil waste).

## 4.2 Control

The integrated management of weeds will be dependent on the type, location and size of infestation. The following noxious weeds are a priority and must be controlled in accordance with the *Noxious Weeds Act 1993*. Weed control procedures are listed in Appendix B.

### 4.2.1 Blackberry (*Robus fruticosus s.l*)

The blackberry is regarded as a weed of national significance. The thicket grows quickly, infesting large areas, displacing native plants and animals and providing a harbour for pests. Blackberry thickets can also be a fire hazard, increasing fire intensities and creating an obstruction to watercourses during fire outbreaks. Due to its flowering fruit, seeds can be carried and dropped over large distances making the containment of this weed almost impossible. Therefore eradication and infestation prevention are the best ways to control the noxious weed.

Blackberry thickets have been observed in the TSR as well as the landfill and biodiversity offset areas. The following measures will be implemented:

- Control of blackberries will be carried out in conjunction with the *Pest Management Plan* (document reference 23464.62571) as these species harbour a number of pest species. This will include the removal of thickets with earthmoving equipment or through slashing. This method however does not completely destroy the weed as it does not remove the root system, allowing the plant to survive through coppicing.
- Following removal, application of herbicides will allow for the final destruction of the root system. Application must only be carried out after sufficient regrowth of the plant. This will promote the uptake of the herbicides to all areas of the weed, including the root system. The most efficient time for application is between the months of December and March, when the plant is at its most active growth stage.
- For environmentally sensitive areas, or areas with limited access for machinery (ie TSR), the Basal Bark Treatment or the Cut Stump Method may be used as alternate eradication methods. Basal Bark Treatment involves the application of herbicide mixed with diesel to each stem of the bush. Basal Bark Treatment is only suitable for small bushes with stems less than five (5) centimetres in diameter. Cut Stump Treatment is more labour intensive but more effective. The bush is cut at the base and an environmentally safe herbicide such as Vigilant Gel or Glyphosate is immediately applied to the stump. The Cut Stump Treatment is more suitable for stems greater than five (5) centimetres in diameter.
- Herbicides can be applied as a singular control measure, however, it can be difficult to determine the correct amount of herbicide required. Larger thickets are often under-sprayed resulting in little impact being made. However for smaller thickets it can be effective. Herbicide control is not to be used as a single control method for larger thickets and that physical removal is to be undertaken before herbicides are applied. The type and amount of herbicide used will be dependent on thicket size, environmental conditions, proximity to watercourses and costs of the herbicides. The applicator must have the correct accreditation and follow label instructions when applying the herbicide.
- All plants that are physically removed must be disposed of in a manner that will not promote the spread of seeds. Removal of blackberry thickets will be undertaken during construction and operation of the landfill and biodiversity offset area.
- Stockpiled weeds may be burned at the landfill site according to the *Fire Management Plan* (document reference 23464.62591). It is expected that a burning area will be designated adjacent the sedimentation pond, however this will be confirmed in the final detailed design for the site.
- Continual monthly monitoring of treated areas will be carried out to ensure that control methods are effective and that no infestations are reoccurring (CRC, 2008).

## 5. Monitoring

Monitoring is an important part in the prevention and control of noxious weeds. Monthly monitoring of treated areas will be undertaken to assess effectiveness of methods and to remove any regeneration of plants. Monitoring will also provide an indication to whether control methods are having an unintentional impact on native flora and fauna. Weed control will continue for up to five (5) years after rehabilitation of the offset area and five (5) years after post operations and rehabilitation of the landfill cells. Two (2) comprehensive searches for noxious weeds will be implemented each year, one in late spring (November) and another in late summer (February) (EA Systems, 2010).

Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for weed management.

The monthly site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this plan; and
- The date and persons involved in the monitoring process.

The Waste Manager is to ensure that appropriate corrective actions are taken within an appropriate time frame to allow for continued compliance with this management plan.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation, in order to adequately assess environmental performance and compliance.

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## **Annex 1.      Noxious Weeds Identification**

**African Lovegrass (*Eragrostis curvula*)**



**Figure 1:** African Lovegrass (DPI, 2013)



**Figure 2:** African Lovegrass seed heads (DPI, 2013)

**Bathurst Burr (*Xanthium spinosum*)**



**Figure 3:** Bathurst Burr (DPI, 2013)



**Figure 4:** Bathurst burr (Weeds Australia, 2013)



**Figure 5:** Bathurst Burr seed capsules ([www.agric.wa.gov.au](http://www.agric.wa.gov.au), 2013)



**Blackberry (*Rubus fruticosus* s.l.)**

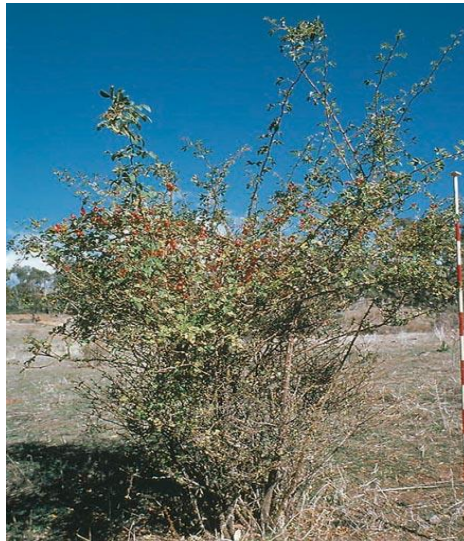


**Figure 6:** Blackberry thicket (DPI, 2013)



**Figure 7:** Blackberry thicket at the proposed landfill pit impact area (EA Systems, 2010)

**Sweet Briar (*Rosa rubiginosa*)**



**Figure 8:** Mature Sweet Briar bush



**Figure 9:** Fruiting Sweet Briar



**Figure 10:** Flowering Sweet Briar bush



**Coolatai grass (*Hyparrhenia hirta*)**



**Figure 11:** Coolatai grass tussock (DPI, 2013)



**Figure 12:** Coolatai grass seed head (DPI, 2013)



**Figure 13:** Coolatai grass seed head (DPI, 2013)



**Serrated Tussock (*Nassella trichotoma*)**



**Figure 14:** Serrated Tussock in full flower (DPI, 2013)



**Figure 15:** Serrated Tussocks spread throughout an area (DPI, 2013)



**Figure 16:** Serrated Tussock seeds (DPI, 2013)

**Chilean Needle grass (*Nassella neesiana*)**



**Figure 17:** Chilean Needle grass ([www.weeds.org.au](http://www.weeds.org.au), 2013)



**Figure 18:** Chilean Needle grass stem and seed heads ([www.esc.nsw.gov.au](http://www.esc.nsw.gov.au), 2013)



**Figure 19:** Chilean Needle grass seed heads ([brg.cma.nsw.gov.au](http://brg.cma.nsw.gov.au), 2013)

## **Annex 2. Weed Control Procedures**

## **Weed Control Procedures**

All weed management works outlined in this management plan are to be implemented by a suitably qualified person. Details of specific weed control techniques to be used such as hand pulling weeds, grass control and the use of herbicides are described in Muyt (2001).

### **Weed Treatment**

Weed control techniques within the project area will be undertaken using minimal disturbance technique so as to prevent disturbance of the soil. Disturbance to the soil will result in increased weed germination and potentially lead to soil erosion.

#### **Hand Pulling**

Hand pulling of weeds includes:

- Selecting the most appropriate tool for the weed being removed (if required);
- Minimising soil disturbance by controlling weeds when the soil is moist;
- Control plants before fruits or other propagules develop;
- Remove excess soil from the root system when there is no risk of spreading vegetative material;
- Cover disturbed soil or gaps with leaf litter and twigs;
- Ensure bulbs, corms, tubers, rhizomes or stolons are carefully dug out; and
- Bag all propagules before removing them off-site (Muyt, 2001).

#### **Herbicide Use**

Herbicides are required for use for the spraying of herbaceous and re-shooting woody weeds. Only a non-specific herbicide (e.g. glyphosate) will be used for this work. Herbicide use near waterways will not be permitted.

#### **Spot Spraying**

Spot spraying will be required for seedlings and the regrowth of the woody weeds including blackberry plants located on site. Woody weeds will be controlled using non-selective herbicide mixed appropriately with water. When spot spraying, ensure that the target plant has been correctly identified and that the target plant is sprayed with the herbicide. Off-target damage should be minimised through the correct identification of target weed species.

### **Primary Woody Weed Treatment**

#### **Cut and Paint Method**

The plant requires to be actively growing with green foliage present. Control will be undertaken during summer months prior to fruiting occurring. The plant needs to be cut horizontally as close to the base as possible and below any branches. Either a chainsaw, handsaw or secateurs can be used to make the cut, depending on the size of the plant. Remove any dirt from the stump and immediately apply the appropriately mixed herbicide directly to the stump using a dabber bottle or brush. Plants may re-sprout and follow up work may be required.

#### **Drill and Fill Technique**

This method is suitable for control of large plants. The drill and fill method involves drilling a hole into the base of a tree below any branches with a hand held drill and a 9 or 10 mm drill bit at an angle of 40-60°. The hole should only penetrate through the sap wood and not through the heart wood. The hole should then be filled immediately with the appropriately mixed herbicide. An eye dropper or a squeeze bottle with a narrow nozzle can be used to fill the hole. If the plant re-sprouts, follow up work will be required.

## **Appendix D. Native Fauna Management Plan**



~ Commercial-in-Confidence ~

# Native Fauna Management Plan

**Armidale Regional Landfill, Waterfall Way**

Report Number 23464.62576



*Prepared for*

*by*

**AECOM**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

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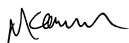


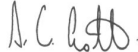
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## 1. Introduction

This document outlines the Native Fauna Management Plan for the approved Armidale landfill facility situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Ltd (EnviroAg) for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This plan details measures for the management of native fauna on-site and the response to the detection of native fauna present in trees and log piles during clearing activities.

This plan aims to encourage best practice environmental management in agreement with the principles of ecologically sustainable development.

This plan is a requirement of the Project Approval (PAC NSW, 2012) under Section 75J of the Environmental Planning and Assessment Act 1979 (Appendix A - Statement of Commitment, point 17). Additionally, as part of the Project Approval, a Conservation Management Plan (CMP) is to be prepared and implemented specifying various conditions including:

- Koala management for the site access; and
- A protocol for tree removal, which will include a prohibition on the use of loud or heavy machinery within 100m of Little Eagle nest trees during breeding season (August to January)

This Native Fauna Management Plan forms part of the *Biodiversity Offset Management Plan* (BOMP) (document reference 22678.38513) which satisfies the approved requirements of the CMP.

### 1.1 Purpose and Objective

The purpose of this Native Fauna Management Plan is to prevent and minimise negative impacts on native wildlife, particularly those of a high conservation status. The following objectives have been designed to address the requirements of the legislation listed in Section 1.2. They provide the foundations on which mitigation measures are built upon throughout this management plan.

The key objectives are:

- Maintain species populations, richness and ecological communities which are threatened with extinction at a regional, national and international level (consistent with the EPBC Act and the TSC Act);
- Protection of Priority Fauna habitats (consistent with the provisions of the EP&A Act and the TSC Act);
- Protection against removal and harm to individuals of native species (in accordance with the NPW Act); and
- Protection of migratory bird species and their habitat (as covered by the EPBC Act and the JAMBA, CAMBA and ROKAMBA agreements).

### 1.2 Key Legislation

Legislation, standards and international agreements applicable to this management plan include:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Threatened Species Conservation Act, 1995* (TSC Act);
- *Environment Planning and Assessment Act, 1979 – State Environmental Planning Policy No. 44: Koala Habitat Protection* (EP&A Act);

- *National Parks and Wildlife Act, 1974* (NPW Act); and
- The Japan-Australia (JAMBA), China-Australia (CAMBA) and Republic of Korea-Australia (ROKAMBA) Migratory Bird Agreements.

### **1.3 Document Review**

This Native Fauna Management Plan shall be reviewed annually and when circumstances change that may affect the content of this plan, such as amendments to legislation. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment shall be revised. Information to be considered when reviewing this plan will include complaints, incidents, monitoring data and the results of any external audit and inspection.

## 2. Identified Fauna

A total of 113 fauna species are known to occur on the site. Of these species, 80 bird species (1 exotic, 5 threatened), 15 mammal species (4 exotic, 2 threatened), 9 lizard species, 1 turtle and 8 frog species were recorded during field surveys (EA Systems, 2010). The number of species allocated to each fauna group is listed in Table 1 below.

**Table 1:** Fauna groups and number of species (EA Systems 2010)

Fauna Group	Number of Species
Birds	80 (5 threatened, 1 exotic)
Mammals	15 (2 threatened, 4 exotic)
Reptiles	10
Amphibians	8

Of the fauna species identified during field surveys, seven species are classified as threatened. These are the Speckled Warbler (*Chthonicola sagittata*), Diamond Firetail (*Stagonopleura guttata*), Eastern Bent-Wing Bat (*Miniopterus schreibersii oceanensis*), Koala (*Phascolarctos cinereus*), Scarlet Robin (*Petroica boodang*), Varied Sittella (*Daphoenositta chrysoptera*) and Little Eagle (*Hieraaetus morphnoides*). Furthermore, the Little Lorikeet (*Glossopsitta pusilla*) and the Hooded Robin (*Melanodryas cucullata cucullata*), which are also listed as threatened, have been observed adjacent to the study site, in the TSR (EA Systems 2010).

### 3. Identified Potential Impacts

In relation to native fauna, the adverse impacts that may result from clearing, construction and operation of a landfill include loss of habitat, habitat fragmentation and reduced connectivity, increased competition and predation from feral animals and vermin, and consequences arising from the generation of increased dust, noise and light levels, traffic hazards, litter and chemical contamination to air, soil and water. Such disturbances reduce the carrying capacity of the habitat by limiting the amount of resources able to be utilised by species, and by reducing the 'desirability' of the habitat for individuals to utilise.

Given the nature of landfill developments, the consequence of combined impacts upon species persistence and biodiversity will be intense and cover a timescale that is at least intergenerational, if not permanent. It is likely that viable populations of threatened species within the site will no longer persist following the development and that the losses incurred in terms of habitat quality will contribute to the already significant levels of cumulative losses at a regional scale in the New England region.

Indirect impacts upon threatened species can arise from the continuation and contribution of the development towards key threatening processes. These are outlined in Table 2 below.

**Table 2:** Summary of key threatening processes

Threatening Process	Legislation	Likely to Occur On-site	Landfill May Contribute	Potentially Affected Threatened Species
Clearing of native vegetation/ Land clearance	TSC Act EPBC Act	yes	yes	<ul style="list-style-type: none"> <li>• Eastern Bent-wing Bat</li> <li>• Little Eagle</li> <li>• Speckled Warbler</li> <li>• Varied Sittella</li> <li>• Scarlet Robin</li> <li>• Diamond Firetail</li> <li>• Koala</li> </ul>
Loss of hollow-bearing trees	TSC Act	yes	yes	<ul style="list-style-type: none"> <li>• Little Lorikeet</li> <li>• Eastern Bent-wing Bat</li> </ul>
Removal of dead wood and dead trees	TSC Act	yes	no	<ul style="list-style-type: none"> <li>• Speckled Warbler</li> <li>• Varied Sittella</li> <li>• Scarlet Robin</li> <li>• Diamond Firetail</li> </ul>
Anthropogenic climate change/ Loss of climatic habitat caused by anthropogenic emission of greenhouse gases	TSC Act EPBC Act	yes	yes	<ul style="list-style-type: none"> <li>• None, but pose a considerable threat to general biodiversity</li> </ul>
Competition and grazing (land degradation) by the feral European Rabbit ( <i>Oryctolagus cuniculus</i> )	TSC Act EPBC Act	yes	no	<ul style="list-style-type: none"> <li>• None, but poses a considerable threat to general biodiversity</li> </ul>
Predation by the European Red Fox ( <i>Vulpes vulpes</i> )	TSC Act	yes	no	<ul style="list-style-type: none"> <li>• Eastern Bent-Wing Bat</li> <li>• Speckled Warbler</li> <li>• Varied Sittella</li> <li>• Scarlet Robin</li> </ul>

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Competition from feral Honey Bees, ( <i>Apis mellifera</i> L.) (nest hollows occupied by feral honeybees)	TSC Act	yes	no	• Little Lorikeet
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## 4. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 3.

**Table 3:** Roles and responsibilities

Role	Responsibilities
Waste Manager	<ul style="list-style-type: none"> <li>Responsible and accountable for the overall environmental performance of landfill site and the implementation of this plan;</li> <li>Commit to and lead a positive environmental management culture and challenge ‘at-risk behaviour’;</li> <li>Regularly communicate expectations and ensure that workers and others understand and comply with this plan;</li> <li>Undertake the annual review of this document;</li> <li>Conduct monthly site inspections to monitor environmental performance and compliance with this plan; and</li> <li>Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>Implementation and compliance of Management Plan;</li> <li>Implementation of required inspections; and</li> <li>Report to government agencies as required.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>Understand and actively participate in a positive environmental management culture;</li> <li>Identify improvements or initiatives for environmental management; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>

### 4.1 Training and Induction

Workers and other contractors entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site. The training program shall include:

- Details of native fauna of the area and appropriate management measures;
- The adverse impact of feral animals on the local ecosystem and the responsibility of staff in respect to feral animals;
- Management information pertinent to the conservation of significant fauna in and around the project area; and
- Reporting procedures for sightings of animals, including reference material for positively identifying animals.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

## 5. Implementation of Controls

### 5.1 General Management Measures

General management measures for mitigating impacts on threatened species and other native fauna include:

- No domestic pets allowed onsite;
- Establishment of fauna monitoring areas so that the impacts upon species biodiversity can be monitored over time and assessed;
- Sightings of native fauna (including threatened and key species) to be recorded and records maintained by Council. The following details shall be included:
  - Species (if known);
  - Sex (if known);
  - Location (GPS coordinates if possible);
  - Weather conditions;
  - Nearby vegetation type;
  - Reliability of identification;
  - Date and time of sighting; and
  - Name of observer;
- Road-kill resulting from landfill operations will be recorded and records maintained within Council's dedicated file management system. The local NPWS office will be contacted for any road kill of a rare or unusual species to determine a plan of action. All other road-kill will be removed immediately and disposed of at the landfill;
- Vehicles and machinery will yield right-of-way to wildlife;
- Hunting will be prohibited within the site except for when organised pest reduction programs are being implemented;
- Any lighting devices are to be positioned and shielded (i.e. vegetation buffers), where possible, so that they do not cause any glare or light nuisance beyond the required work area;
- External lighting will use, where possible, red or low-pressure sodium lights or LEDs. Bright white lights such as mercury vapour, metal halide or florescent will be avoided where possible;
- Manual switches and motion sensors will be used on all external lighting where possible;
- Low reflective paint or finishes on equipment, as well as reflective tape, will be used instead of external lighting where practical; and
- Clear in accordance with the Vegetation Clearance Protocol located within the *Vegetation Management Plan* (document reference 23464.62561).

### 5.2 Control of Invasive Species

Control of invasive animal species populations, particularly those which represent a 'Key Threatening Processes' shall be conducted. Target species include:

- Foxes;
- Cats;
- Rabbits; and
- Non-natives bee hives.

Control of invasive species shall be conducted in accordance with the supporting *Pest Management Plan* (document reference 23464.62586) and in consultation with, and advice from the NSW Department of Primary Industries. The use of the poison 'pindone' to manage rabbit populations shall be avoided as it poses a secondary poisoning risk to the threatened Little Eagle.



### 5.3 Installation of Artificial Nest Boxes

Artificial nest boxes, appropriate to fauna species within the area, will be installed within the offset areas to improve the habitat quality and provide refuge for displaced animals. Since different species have different requirements for the sizes of hollows, it is important to install hollows which differ in their size, depth, shape, degree of insulation and entrance size. The number installed will vary according to the number of hollows destroyed during clearing activities. Armidale Dumaresq Council (ADC) will commit to a 3:1 ratio of replacing destroyed hollows with nest boxes.

The NSW Wildlife Information, Rescue and Education Service (WIRES) and/or the Northern Tablelands Wildlife Carers may be contacted for advice regarding the nesting box specifications, the supply of nest boxes and their installation. Annex 1 provides an indication on species requirements; however, additional information can be found in the following reference material:

- Adams, George Martin. (1980). *Birdscaping Your Garden*. Rigby, Adelaide.
- Elliot, Rodger. (1994). *Attracting Wildlife to Your Garden*. Lothian, Melbourne.
- Grant, Peter. (2003). *Habitat Garden - Attracting Wildlife to Your Garden*. ABC Books, Sydney.
- Melbourne Zoo Education Service. (n.d.). *Nest Boxes for Native Birds and Mammals*. (leaflet).
- Morrison, Rob. (1996). *The Nestbox Project*. Nature Australia 25(5): 56–63.
- Pedler, Lynn. (1996). *Artificial nest hollows for black-cockatoos*. Eclectus 1: 13.
- Pizzey, Graham. (2000). *The Australian Bird Garden*. Creating Havens for Native Birds. Angus & Robertson, Melbourne.
- RSPCA. (n.d.). *Learn to Live with Possums*. (leaflet).
- Trainor, Russell. (1995). *Artificial nest-hollows*. Bird Observer 759: 5–7.

### 5.4 Fencing of Landfill Area

Active landfill cells will be fenced to minimise access by fauna. Furthermore, the landfill cells will be appropriately covered to prevent scavenging by birds and other feral animals. Refer to the *Pest Management Plan* (document reference 23464.62586) for further details.

### 5.5 Protocol for Vegetation Removal

Vegetation clearing shall be conducted in accordance with the *Vegetation Clearing Protocol* located within the *Vegetation Management Plan* (document reference 23464.62561). Mitigation measures include the following:

- Whenever possible, clearing activities will be undertaken during mid to late summer in order to:
  - Minimise impacts on nesting and hatching avifauna and herpetofauna (greatest impacts in spring);
  - Maximise the likelihood of detection and capture of herpetofauna; and
  - Ensure wildlife load reduction measures are most productive;
- Appropriate release sites shall be chosen, which offer similar habitat resources (e.g. food trees). Since some animals are territorial and new release sites may already have established populations and be at their ‘carrying capacity’, it is worth considering whether animals can be released within a 500 m radius of the development site. Vegetation offset areas surrounding the development site may also be appropriate release sites, due to improved habitat quality by the installation of artificial nest boxes, relocated stags and hollows, and plantings.

### 5.5.1 Spotter Catcher 'Standard Operating Procedure'

Given that there are no legislatively recognised guidelines for 'Spotter Catcher' procedures in NSW, the Draft *QLD Code of Practice for the Welfare of Wild Animals affected by Land Clearing and Other Habitat Impacts and Wildlife Spotter Catchers* forms the basis of the following procedures (Australia Zoo 2009).

The standard operating procedure for 'Spotter Catcher' includes the following steps:

1. Reduction of wildlife load prior to clearing; and
2. Pre-clearance survey.

A wildlife load reduction program shall be implemented by the 'Spotter Catcher' for an appropriate period of time immediately prior to the onset of operational works. The wildlife load reduction program may include, but is not to be limited to, the following measures:

- Fauna trapping using an appropriate range of trapping methods; e.g. ground Elliott traps are suitable for trapping small native mice and rats, and arboreal Elliott traps suitable for species such as sugar gliders;
- Erection of fencing;
- Use of fauna aversion techniques such as temporary lights; and
- Manual or pharmacological capture and removal of fauna.

For live trapping of animals, the 'Spotter Catcher' must abide by animal welfare standards, and hold a current animal care and ethics approval.

Pre-clearance survey techniques, timing and responsibilities have been summarised in Table 4. A pre-clearance survey report shall be prepared by a suitably qualified person or organisation and include the following details:

- Survey date and time;
- Surveyors and details of relevant qualifications and experience;
- Weather conditions;
- Details of methods used during pre-clearing surveys and clearing operations;
- Fauna species displaced by clearing, species captured, species released and any wildlife mortalities resulting either directly or indirectly from the clearing operations;
- Location of fauna within clearing footprint (recorded with GPS) and release locations;
- Hollow-bearing tree register, and comparison of these data to nest-box plan (assess the adequacy of nest boxes installed and how they are mitigating the loss of tree hollows); and
- Discussion of the effectiveness of the methods employed.

For additional information regarding vegetation removal and the requirements of a fauna 'Spotter Catcher', refer to the *Vegetation Clearing Protocol* located with the *Vegetation Management Plan* (document reference 23464.62561).

**Table 4:** Pre-clearance survey techniques

Fauna to be Protected	Methodology	Timing	Responsibility
Arboreal Mammals	<p>Arboreal mammal surveys will consist of stagwatching, spotlighting and call-playback detection.</p> <p>If an arboreal mammal is identified within the clearing limits during nocturnal surveys, the location will be checked during the pre-clearance survey undertaken on the following morning immediately prior to clearing.</p> <p>The removal of any arboreal mammals from within the clearing zone will be undertaken in accordance with animal care and ethics guidelines.</p>	<p>Nocturnal spotlighting will be undertaken on the night immediately prior to clearing. A diurnal visual inspection of trees identified as supporting arboreal fauna within the clearing limits would be undertaken immediately prior to the commencement of clearing.</p>	Environmental Officer
Koalas	<p>Koala surveys will consist of spotlighting and diurnal surveys.</p> <p>If a koala is identified within the clearing limits during nocturnal surveys, the location will be checked during a diurnal visual inspection undertaken on the following morning immediately prior to clearing.</p> <p>If a koala is identified within the clearing limits, the tree which it is occupying will be retained, a 50 metre buffer around the tree will be instated. If the koala does not vacate the clearing footprint, a corr-flute fence will be erected around the base of the tree occupied by the koalas. A wire cage trap will be placed at the exit in the fence. The trap will be set during the day and checked every 2-3 hours through the night until the koala is caught (AMBS 2011). The wildlife carer will manage any injured koalas, and the Spotter Catcher will relocate koalas upon confirmation of their health.</p>	<p>Nocturnal spotlighting will be undertaken the night immediately prior to clearing.</p> <p>A diurnal visual inspection of trees identified as supporting koalas within the clearing limits would be undertaken immediately prior to the commencement of clearing.</p>	Environmental Officer
Microchiropteran Bats	<p>Searches of potential microbat roost sites within tree hollows will be undertaken prior to clearing. Surveys will involve active searches of structures for signs of use by microbats and the use of a torch and an Anabat Detector if required. Any microbats found will be managed in accordance with the animal care and ethics guidelines.</p>	<p>Timing of microbat surveys will be accordance with the EPBC Act Survey Guidelines.</p>	Environmental Officer
Little Eagle	<p>Prior to clearing, surveys will need to be done by an expert to check whether the little eagle nest recorded during field surveys still exists within or beside the landfill footprint (refer to the Vegetation Clearing Protocol, section 5.2.1 of the accompanying <i>Vegetation Management Plan</i> (document reference 23464.62561)).</p>	<p>Diurnal surveys immediately prior to the commencement of clearing.</p>	Environmental Officer

### 5.5.2 Relocation of Hollows and Stags

Hollow-bearing stags and trees which have been removed shall be relocated within offset areas as logs, or erected as stags if feasible. Log piles shall also be redistributed as singular fallen logs within the offset areas to emulate natural conditions. Fallen branches and timber will be allowed to accumulate over time and stumps with the potential to stand upright should be positioned to allow for birds and arboreal mammals to use the hollows for roosting and nesting.

### 5.5.3 Structural Complexity

It is well documented that an increase in habitat complexity correlates with an increase in the numbers and types of bird species (e.g. Munro et al. 2007). For this reason, the process of establishing a complex structural habitat, with multiple layers of vegetation, will commence as soon as practicable in the offset areas prior to extensive clearing for the landfill pit and associated infrastructure. Complexity can be established by selecting locally indigenous plants that grow to different heights, such as trees, tall shrubs, low shrubs and ground cover, and by planting in a non-uniform manner. This is to support fauna which have been negatively impacted or displaced during clearing events.

Several threatened species of birds are likely to be displaced due to the construction of the landfill pit. However, the impacts will be minimised through the clearing required for construction of the landfill over its proposed 50 year lifespan. This will allow the maximum possible amount of habitat to remain while the Stringybark offset area becomes progressively more established. The habitat requirement for each of these species differs. Consideration must be given to the species' requirements outlined in Table 5. Plant species must be sourced and propagated from local stock so that the offset area is representative of the natural woodland of the area. Refer to Section 4.4 the *Vegetation Management Plan* (document reference: 23464.62576) for additional information.

**Table 5:** Habitat requirements

Species	Required Habitat
Diamond Firetail ( <i>Stagonopleuraguttata</i> )	Well-established overstory, shrubs and ground cover.
Speckled Warbler ( <i>Chthonicola sagittata</i> )	Well established groundcover and shrub layer.
Varied sittella ( <i>Daphoenositta chrysoptera</i> )	Establishment and retention of mature trees.
Scarlet Robin ( <i>Petroica boodang</i> )	Well established groundcover layer and tree canopy.
Hooded Robin ( <i>Melanodryas cucullata cucullata</i> )	Ground cover and litter very important, found in woodlands with shrub layer dominated by acacias.
Little Eagle ( <i>Hieraaetus morphnoides</i> ).	Retention of mature Yellow Box trees.
Little Lorikeet ( <i>Glossopsitta pusilla</i> )	Well established canopy of flowering eucalypts and melaleucas.
Eastern Bent-Wing Bat ( <i>Miniopterus schreibersii oceanensis</i> )	Well established canopy and shrub layer.
Koala ( <i>Phascolarctos cinereus</i> )	Well established canopy of primary and secondary eucalypt food species.

## 6. Monitoring and Review

Site inspections shall be conducted on a monthly basis to monitor environmental performance and compliance with the mitigation measures outlined in this plan. The site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this plan; and
- The date and persons involved in the monitoring process.

The Waste Manager or their delegate is to ensure that appropriate corrective actions are taken within an appropriate time frame to allow for continued compliance with this management plan.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation, in order to adequately assess environmental performance and compliance.

Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for native fauna management.

### 6.1 Performance Indicators

The effectiveness of this Native Fauna Management Plan will be determined through a range of performance indicators associated with the monitoring program.

The performance of pre-clearing and clearing procedures will be assessed against:

- Low rates of fauna injury and mortality resulting from clearing operations, particularly of threatened species;
- Successful capture and release of fauna displaced by clearing operations;
- Rapid processing, treatment and release of injured fauna (<24 hr turnover unless animal is injured and in need of veterinary attention);
- Accurate quantification of fauna habitat features and hollow-bearing trees being removed; and
- Data collation and reporting of these measures.

To monitor the performance of offset areas in providing habitat for species, the following performance indicators will be used:

- Diversity of native fauna species present;
- Abundance of native fauna species present;
- Threatened species abundance; and
- Diversity and abundance of feral animals.

These data will need to be compared to baseline data, some of which can be found in the report *Flora and Fauna Assessment* (EA Systems, 2010).

## 7. Koala Management Plan

### 7.1 Plan Objectives

The objectives and subsequent management actions set out in this plan are guided by the objectives listed within the *Approved Recovery Plan for the Koala* (DECC 2008), namely:

- To conserve koalas in their existing habitat;
- To rehabilitate and restore koala habitat and populations;
- To develop a better understanding of the conservation biology of koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale;
- To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care;
- To manage overbrowsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat; and
- To coordinate, promote the implementation and monitor the effectiveness of the NSW Koala Recovery Plan across NSW.

The objectives of this plan are:

- To describe the Koala habitat at the site;
- To identify the key issues in managing the Koala population and its habitat in the area; and
- To outline management actions to address the above key issues.

### 7.2 Key Issues

The key issues in managing the Koala and its habitat are listed below:

#### 7.2.1 *Loss of Habitat.*

Clearing of land for expansion of human settlement, for example, for agriculture, housing, mining, forestry, industry and roads has caused significant reduction Koala population due to habitat loss.

#### 7.2.2 *Roadkill.*

The death of Koalas as a result of being hit by motor vehicle can have significant impacts on Koala populations. Koalas regularly travel along the ground and are very susceptible to being hit by motorised vehicles, particularly as roadsides often support the only woodland remnants in an area.

#### 7.2.3 *Dog Attacks and feral animals.*

Attack by dogs may contribute to the decline of the Koala population. Koalas are defenceless against dogs and feral animals especially when found moving along the ground (Smith 1992). Feral animals, such as foxes and cats, have been blamed for preying upon young Koalas when their mothers descend to the ground to change trees.

#### 7.2.4 *Disease*

There are four (4) common Koala diseases caused by the chlamydia organism. Chlamydia is harmless when resources are unlimited, however manifests in times of stress, which happens when habitat is reduced.

### 7.2.5 Dieback

Changes in the balance of the ecosystem can lead to dieback. The cutting back of the original vast forests has created patches of forest separated from each other by treeless land. Small, isolated patches of forest are prone to dieback. Dieback is a general term for the gradual dying of trees due to factors such as land degradation, leaching of soil nutrients, changes in the composition of vegetation communities, exposure to weather and excessive defoliation (or loss of leaves).

## 7.3 Management Actions

The following management actions are based on the three requirements for Koala population to survive and thrive, namely:

- Availability of suitable feed trees;
- Existence of tree movement corridors; and
- Protection from key threatening processes.

### 7.3.1 Habitat Protection

Clearance of the Stringybark Woodland at the site will be limited to the specified landfill footprint and associated infrastructure (including site perimeter fencing). A pre-clearance survey will be conducted by an ecologist (refer *Vegetation Management Plan* and *Vegetation Clearance Protocol* (document reference 23464.62561) for further information).

### 7.3.2 Rehabilitation and Expanding Habitat

Rehabilitation of areas to the west of the landfill pit would provide a linkage to the woodland remnants within 600 m of the development. Fencing of the area, which contains Stringybark trees, will allow for a degree of natural regeneration. Planting of additional trees in the southern portion of this area will be required to achieve adequate regeneration of the offset area. Refer to Figure 1 for offset areas.

The planting program would only utilise local tree species; these would be obtained from a local seed source (refer *Vegetation Management Plan* (document reference 23464.62561) for further information).

Controlled burning may be used as a woodland management tool; refer to the *Fire Management Plan* (document reference 23464.62591) for further information.



**Figure 1.** Location of the proposed Stringybark Woodland offset area, the grassland offset area and the area of the landfill pit and associated infrastructure (transparent).

Note: The existing Stringybark Woodland contains some elements of Box Gum Woodland (individual Yellow Box and Blakely's Red Gum trees).



### 7.3.3 Prevention of Road Kill

Measures to minimise road kill of Koalas in the project area include the following:

- All staff and contractors on site will undergo induction that would include Koala awareness;
- A speed limit of 40 km/h will be established for the access road leading to the landfill cells. Once past the wheel wash area the speed limit will be decreased to 10 km/h;
- Contact details for treating injured animals will be provided on the site; and
- Koala that are injured or die as a result of onsite activities will be documented and information included in the annual report submitted to the OEH. The incident will be reviewed and managed accordingly by the Waste Manager or designated delegate.

### 7.3.4 Fencing

A Koala proof fence will be erected around the landfill active cells, leachate ponds and sediment basins. Addition information regarding fencing for the project can be found within Annex 2 of the *Vegetation Management Plan* (document reference 23464.62561).

### 7.3.5 Monitoring of Population

Knowledge of the Koala population in the area would be improved through reporting of all Koala sightings and incidents observed at the project site. Staff are to report on observations of Koalas, road kills and other relevant incidents. This information will be included in the annual report to the OEH.

### 7.3.6 Monitoring of Disease

All Koalas found sick, injured or dead will be taken to a wildlife rescue organisation in Armidale for examination, particularly to determine if any animals are suffering from disease such as chlamydia.

### 7.3.7 Dogs and Feral Animals

Domestic dogs are not allowed to enter the project site. Information on managing feral animals is detailed in the *Pest Management Plan* (document reference 62586).

## 7.4 Roles and responsibilities

The roles and responsibilities for Koala Management Plan would be the same as those outlined in Table 4 in Section 3.

## 7.5 Monitoring and Review

Site inspections will be conducted as outlined in Section 5 of the *Native Fauna Management Plan* (this document) and the *Pest Management Plan* (23464.62586).

## 7.6 Reporting

An annual report will be prepared by ADC for submission to the OEH. The following will be included, as a minimum, within the report:

- Number and location of Koala deaths attributed to road kills within and surrounding the project site;
- Number and location of Koalas observed within and surrounding the project site, including the access road to the site;

- Information on the success of the rejuvenation of the offset areas as they pertain to Koala habitat; and
- Confirmation that the measures undertaken to protect Koalas in the area have been adequately maintained: e.g. employees and contractors have been inducted, speed limits adhered to, etc.

## 8. References

- Adams, George Martin. (1980). *Birdscaping Your Garden*. Rigby, Adelaide.
- Australia Zoo, 2009.
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- Trainor, Russell. (1995). *Artificial nest-hollows*. *Bird Observer* 759: 5–7

## 9. Annexes

Annex 1.	Nest Box Requirements for Fauna Species	1-1
Annex 2.	Detailed Control Measures	2-1

## **Annex 1. Nest Box Requirements for Fauna Species**

SPECIES	INTERNAL DIAM (mm)	DEPTH/LENGTH (mm)	ENTRANCE DIAM (mm)	VERTICAL/HORIZ.	HEIGHT (m)
Black-Cockatoo, Glossy	300	870–1000	160 x 200	v	
Boobook, Southern			150	h	
Cockatoo, Sulphur-crested			150	v	
Corella, Little			150		
Corella, Long-billed			150		
Duck, Australian Wood	200	500	120	v	
Duck, Pacific Black	450 x 300		120	h	
Galah	200	650	120–150	v	6
Kestrel, Nankeen	400	750	100	v	5
Kingfisher, Sacred	130	600–900	75	h	5–10
Kookaburra, Laughing	300–400 x 150–200	500–600	open, >130	h	5–10
Lorikeet sp.	120	600	60	h	5
Lorikeet, Little			25–30		
Lorikeet, Musk			25–30		
Lorikeet, Purple-crowned			25–30		
Owl, Eastern Barn	400	750	open, >150	h	5
Owlet-nightjar, Australian	100–150	300–400	30–120	v	5
Pardalote sp.	120	400–500	30–45	h	5
Pardalote, Striated	90–200 x 120–150	200	25–35	v/h	
Parrot, Red-rumped	100–240	400–600	25–120	v/h	5
Rosella sp.	120–200	350–800	70–120	v/h	5
Rosella, Crimson	150–200	350–800	75–100	v/h	5–6
Rosella, Eastern	135–240	350–800	60–100	v/h	5–6
Shrike-thrush, Grey	150–200 x 200–300	150–300	open, >150	h	
Swallow, Welcome	130		open	h	3
Teal, Chestnut	200–400 x 300	450–750	80–120	v	1.5
Teal, Grey	200–450 x 300	450–750	80–120	v	1.5
Treecreeper sp.	90–150	100–400	50–80	v	
Treecreeper, White-throated	75–100	300–400	50–70	v	5
Antechinus, Yellow-footed			20–25		
Bat sp.	70–100 x 150–240	200–250	15–20 (slit)	v	
Bat, Chocolate Wattled			10 (slit)		
Bat, Gould's Wattled			10 (slit)		
Bat, Lesser Long-eared			10 (slit)		
Brush-tail-Possum	210 x 240–320	380–400	90–150	v	4–8
Glider, Feather-tailed			20–25		
Glider, Squirrel			60		
Glider, Sugar	200–250	300–450	25–50	v	4–8
Phascogale, Brush-tailed			25–30		
Ringtail-Possum	250	350–400	60–90	v	4–8

(Birdlife Australia, 2013)

## **Annex 2. Detailed Control Measures**

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Control invasive animal species populations, particularly those which represent a 'Key Threatening Process' for the conservation and recovery of threatened species. Target species include the fox, cat and rabbit, and also the introduced bee as this also represents a Key Threat to the Little Lorikeet. This shall be conducted in accordance with the supporting Pest Management Plan and in consultation with, and advice from the NSW Department of Primary Industries. Avoid the use of pindone to manage rabbit populations, as it poses a secondary poisoning risk to the threatened Little Eagle.	Environmental Officer	Construction/operation/rehabilitation	4.2, Pest Management Plan



Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	<p>All employees and contractors will undergo site specific environmental awareness training during inductions. The fauna component of this training will include:</p> <ul style="list-style-type: none"> <li>• Fauna of the area;</li> <li>• Issues related to fauna management and staff responsibilities;</li> <li>• The adverse impact of feral animals to the local ecosystem and the responsibility of staff in respect to feral animals;</li> <li>• Management information pertinent to the conservation of significant fauna in and around the project area; and</li> <li>• How staff report sightings of animals, including reference material for positively identifying animals.</li> </ul> <p>Site personnel will refresh training every two years.</p>	All employees and contractors	Construction/operation/rehabilitation	3.1
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Install artificial nest boxes appropriate to fauna species within the area. This will be done in the offset areas to improve the habitat quality and provide refuge for displaced animals. The number installed will vary according to the number of hollows destroyed when clearing; Council will commit to 3:1 nest boxes installation.	Environmental Officer	Before Clearing occurs	3.2.3

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Pest control	The landfill shall be fenced (with a closed gate) to prevent access by fauna. The landfill will be appropriately signposted and covered on a regular basis to prevent scavenging by birds. Refer to <i>Pest Management Plan</i> (Document reference: for further details.	Waste Manager	Operation	4.4, Pest Management Plan
2	Pest control	No domestic pets shall be allowed on site.	Anyone accessing site	Construction/Operation	4.2, Pest Management Plan
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Establish fauna monitoring areas so that the impacts upon species biodiversity can be monitored over time and assessed.	Superintendent/ Environmental Officer	Ahead of development/operation/ rehabilitation	5
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	All road-kill will be recorded on a site fauna sightings database. The local NPWS office will be contacted for any road kill of a rare or unusual species to determine a plan of action. All other road-kill will be removed immediately and disposed of to an approved disposal site.	Super Intendant/ Environmental Officer	Operation	4.1

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	<p>Key/Threatened vertebrate fauna sightings (particularly those of threatened species), will be recorded on a site database.</p> <p>Details to be recorded include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Species (if known);</li> <li>• Sex (if known);</li> <li>• Location (GPS coordinates if possible);</li> <li>• Weather conditions;</li> <li>• Vegetation type;</li> <li>• Reliability of identification;</li> <li>• Date and time of sighting; and</li> <li>• Name of observer</li> </ul>	Super Intendant/ Environmental Officer	Ahead of development/operation/ rehabilitation	3.1, 4.1
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	All vehicles will yield right-of-way to wildlife. This will be included as part of the site induction.	All personnel accessing site	Construction/operation/rehabilitation	4.1
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level. Pest Control.	Employees and contractors will not be permitted to hunt on the site except for when organised pest reduction programs are being implemented.	Landfill Operators, Contractors and Others	Construction/operation/rehabilitation	4.1, Pest Management Plan

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	All external lighting shall be targeted where possible, using shields and directional lighting to minimise light spill beyond the required work area.	Waste Manager	Construction/operation	4.1
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	External lighting will use, where possible, red or low-pressure sodium lights, LEDs. Bright white lights such as mercury vapour, metal halide or florescent will be avoided where possible.	Waste Manager	Construction/ operation	4.1
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Manual switches will be used on all external lighting.	Waste Manager	Construction/operation	4.1
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Low reflective paint or finishes on equipment, and reflective tape will be used instead of external lighting where practical.	Waste Manager	Construction/operation	4.1
1	Protection of Priority Fauna habitats	Progressive clearing, with landfill cells being cleared only when necessary.	Waste Manager	Construction/operation	3.2.2
1	Protection of Priority Fauna habitats	Relocation of hollow-bearing stags to offset areas.	Super Intendant/ Environmental Officer	Construction	3.2.1

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Protection against harm and removal of individuals of native species	<p>A licensed 'Spotter Catcher' must be onsite 24 hours prior to and during vegetation clearing activities, to capture and relocate any native animals found whose habitats are to be destroyed.</p> <p>Pre-clearance and clearance surveys shall be carried out within the direct impact area. Refer to section 3.1 for the Standard Operating Procedure.</p>	Super Intendant/ Environmental Officer	construction	3.1
1	Pest Control.	Feeding or interacting with feral or native fauna will be prohibited.	Everyone accessing site	Construction/operation	
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	No clearing will be undertaken unless specifically required and authorised by the Environmental Officer	Super Intendant/ Environmental Officer	Construction/operation	4.5
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Clearing of remnant tree and shrub vegetation will be carried out in campaigns and will, where practicable, be restricted to late summer and autumn in order to avoid spring breeding, hollow-nesting birds and bats.	Super Intendant/ Environmental Officer	Construction	3.2

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	<p>If native fauna is encountered it will, where practical, be allowed to make its own way from the work area.</p> <p>A person, other than an accredited and licensed wildlife spotter/catcher, may not catch, remove, harass or disturb any permanently protected animal (which includes all native vertebrate animals) under the NPWS Act 1979, unless that person is licensed to do so.</p>	Everyone accessing site	Operation/rehabilitation	3.1
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	If injured fauna are encountered, employees will contact a voluntary wildlife care organisation such as WIRES (1800 641 188) or the Northern Tablelands Wildlife Carers group (1800 008 290). If injured, the animal shall be taken to the nearest veterinary hospital.	Everyone accessing site	Construction/ Operation/ rehabilitation.	
2	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Appropriate speed limits will be set, signposted and adhered to on all roads to avoid road-kills and the subsequent attraction of fauna (40 km/h along access road and 10 km/h once past wheel wash area, where applicable)	Everyone accessing site	Construction/operation	
1	Protection of migratory bird species and their habitat	Leachate management, so as not to affect the White-bellied Sea Eagle population in the Gara-Macleay system, or other wetland birds using water bodies downstream from the landfill.	Super Intendant/ Environmental Officer	Operation/rehabilitation	Leachate Management Plan

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Recover threatened species populations. Pest Control.	Undertake Fox and feral cat control programs. This will include areas containing roosting sites, and maternity caves for threatened bat species.	Super Intendant/ Environmental Officer	Construction/operation	4.2, Pest Management Plan
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Retain existing vegetation along roadsides, in paddocks and remnant stands of native trees; Retain native vegetation around roost sites.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Vegetation Management Plan and Vegetation Management Protocol
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Retain dead timber on the ground in open woodland areas.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Vegetation Management Plan and Vegetation Management Protocol
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Encourage regeneration of habitat by fencing remnant stands to exclude non-native fauna (i.e. cattle and sheep); Increase the size of existing remnants, plant trees and establish buffer zones of unimproved uncultivated pasture around woodland remnants.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Vegetation Management Plan and Vegetation Management Protocol

Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Assess the importance of linkages for the species between ecological resources across the broader landscape.	Super Intendant/ Environmental Officer	Construction/operation/remediation	
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Reduce heavy grazing by domestic stock in areas of known or potential habitat; the site will be fenced.	Super Intendant/ Environmental Officer	Construction/operation/remediation	
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Control weeds in areas of known habitat.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Weed Management Plan
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Ensure remnant populations remain connected or linked to each other and, in cases where remnants have lost connective links, re-establish links by revegetating sites to act as stepping stones for dispersal.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Vegetation Management Plan and Vegetation Management Protocol
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Minimise the use of pesticides and herbicides in foraging areas.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Weed Management Plan



Priority	Objective	Management Action	Responsible Personnel for implementation	Timing	Section referred to
1	Maintain species populations, richness and ecological communities threatened with extinction locally and at a national level.	Apply low-intensity, mosaic pattern fuel reduction burns in or adjacent to Koala habitat; Identify road-kill black spots and erect warning signs, reduce speed limits or provide safe crossing points to reduce Koala fatalities. 40 km/h speed limit on access road and 10km/h once past wheel wash area.	Super Intendant/ Environmental Officer	Construction/operation/remediation	Fire Management Plan

## **Appendix E. Disease Monitoring Protocol**

~ Commercial-in-Confidence ~

# Disease Monitoring Protocol

**Armida Regional Landfill, Waterfall Way**

Report Number 23464.62581



*Prepared for*

*by*

**AECOM<sup>®</sup>**

Level 21, 420 George Street  
SYDNEY NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6774 8333  
Free call: 1800 445 389  
ABN: 56 135 005 999

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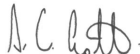

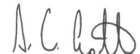
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<b>Signatures</b>					

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This document provides information to address the intent of Project Number 23464 as agreed to by AECOM Pty Ltd.

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## **1. Introduction**

This document outlines the Disease Monitoring Protocol (DMP) for the approved Armidale Regional Landfill situated on Waterfall Way, approximately 12 km east of Armidale. The protocol has been prepared by EnviroAg Australia Pty Ltd for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This DMP aims to encourage best practice environmental management in agreement with the principles of ecological sustainable development during the lifetime of the landfill (i.e. construction, operation, and post operation for a nominal period of at least 5 years after completion of rehabilitation works and decommissioning of the site).

The DMP is a requirement of the Project Approval Section 75J of the *Environmental Planning and Assessment Act 1979* (PAC NSW, 2012).

### **1.1 Objective**

The objective of this DMP is to prevent and minimise negative impacts on biodiversity or agricultural productivity from disease outbreaks.

### **1.2 Document Review**

This DMP shall be reviewed annually and when circumstances change that may affect the content of this protocol. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this protocol should include complaints, incidents, monitoring data and the results of any external audit and inspection.

## 2. Identified Potential Impacts

There is a potential risk for animal and plant disease outbreak at the proposed landfill during the construction, operation and rehabilitation stages of the landfill. The proposed landfill will receive putrescible waste from diverse sources including industrial/commercial/construction waste, general solid waste, animal matter (including dead animals or animal parts), and residual treatment matter/waste from the ADC sewage treatment plant (STP).

The deposited wastes and the leachate produced at the landfill may host potential diseases and, in turn, infect pests and vermin that may have access to the waste. Furthermore, it is envisaged that the landfill may attract and support increased populations of pests and vermin. Certain pests can become vectors of disease to the surrounding environment. Vermin, including flies and insects could also act as disease carriers and thereby pose a health risk to human health and the environment.

It is possible for noxious weeds to propagate from the deposited wastes; these plants can also host a range of plant diseases.

A disease outbreak at the proposed landfill may adversely impact on the:

- 1) Biodiversity- specifically the endangered and threatened flora and fauna species and endangered ecological community occurring at the site.
- 2) Oxley Wild Rivers National Park, a World Heritage Area - located approximately 4 km southeast of the landfill site (measured as straight line between both points, ie. as the bird flies) and 6 km by river for propagules to travel by river.
- 3) Agricultural viability of the land used for grazing stock (sheep and cattle) and the Travel Stock Reserve (TSR) – agricultural land is located within a 1 km radius of the proposed landfill.
- 4) Council staff, contractors and other visitors present at the landfill site.
- 5) Aquatic environment - specifically, the movement of contaminated leachate into ground and surface waters.

A DMP aimed at encouraging best practice environmental management in agreement with the principles of ecological sustainable development has been developed and subsequently discussed in section 4 of this report.

### 2.1 Identified Potential Risk

There is a risk for the spread of disease, provided that there is a source, a vector and a susceptible population of individuals. In this instance, all of the factors which promote the spread of some diseases are present, particularly if animals access the landfill site. A pathway for the transfer of some zoonotic diseases to humans is created when domestic pets and livestock come into contact with infected individuals, contract the disease and bring it into households.

Table 1 provides an example of some of the more commonly occurring zoonotic diseases, which may exist in the context of this landfill site.



**Table 1:** Commonly occurring zoonotic diseases

<b>Disease</b>	<b>Vector</b>	<b>Affected Species</b>	<b>Consequence</b>	<b>Potential Risk</b>
Hydatid Tapeworm (parasite)	Dog/dingo, sheep, goat, cattle, kangaroo, wallaby.	Dogs, sheep, goats, cattle, kangaroo, wallaby, humans	Can potentially lead to the formation of cysts in the brains of humans	High
Leptospirosis (bacteria)	Rats, through contact with their urine	Humans	Fever, headaches, and muscle pain. Nausea, vomiting and bloodshot eyes may also occur in humans.	Low/Moderate
Salmonella (bacteria)	Flies	Birds, pigs, humans	Diarrhoea, vomiting as a result of food poisoning in humans	High
Toxoplasma (parasite)	Cats, through contact with their faeces	Humans	May cause miscarriages	Low/Moderate

### 3. Roles and Responsibilities

The roles and responsibilities pertaining to this protocol are detailed in Table 2.

**Table 2:** Roles and responsibilities

<b>Role</b>	<b>Responsibilities</b>
Waste Manager	<ul style="list-style-type: none"> <li>• Responsible and accountable for the overall environmental performance of the landfill site and the implementation of this protocol;</li> <li>• Commit to and lead a positive environmental management culture and challenge 'at-risk behaviour';</li> <li>• Regularly communicate expectations and ensure workers and others understand and comply with this protocol;</li> <li>• Undertake the annual review of this document;</li> <li>• Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this protocol.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>• Responsible for the implementation of this protocol; and</li> <li>• Conduct monthly site inspections to monitor environmental performance and compliance with this protocol.</li> </ul>
Landfill Operator	<ul style="list-style-type: none"> <li>• Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this protocol;</li> <li>• Understand and actively participate in a positive environmental management culture;</li> <li>• Identify improvements or initiatives for environmental management; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>• Understand and adhere to the mitigation measures outlined in this protocol; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>

#### 3.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this protocol and the procedure for monitoring of diseases within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five (5) years.

## 4. Disease Monitoring Procedure

The protocol for monitoring potential diseases associated with the landfill aims at encouraging best practice environmental management at the landfill. The best practice environmental management discussed in this protocol are consistent with the recommendations provided in the *Biodiversity Offset Management Plan* (document reference 22678.38513), the draft *Landfill Environmental Management Plan* (AECOM, 2010), the *Environmental Guidelines: Solid waste landfills* (EPA, 1996) and other management plans related to the landfill including pest and weed management plans. These best practice environmental management actions include:

- Screening of waste for potential contaminants;
- Disease vector control;
- Control and monitoring of weeds; and
- Landfill site management.

### 4.1 Screening of Waste

To minimise risks associated with disease carrying waste material, waste acceptance and screening procedures will be put in place. The screening procedures shall be in compliance with the *Landfill Guidelines: Benchmark Technique Number 21- Screening of Wastes Received* (EPA, 1996). The Waste Manager will implement an inspection and registration program for incoming wastes, which will involve:

- Recording of waste types at the waste transfer station on Long Swamp Road prior to the waste being transported to the proposed landfill for disposal. This system is currently in place at the current landfill with Council using the TipSite software system.

### 4.2 Disease Vector Control

The proposed landfill is likely to attract many different pests, which could become disease vectors. A vector is an organism that carries disease-causing organisms, such as pathogens, bacteria, viruses and parasites, from one host to another. Disease vectors that have potential to access the proposed landfill site include:

- Birds (e.g. gulls (*Chroicocephalus novaehollandiae*) and ibis (*Threskiornis molucca*);
- Rodents (e.g. rats (*Rattus norvegicus*) and mice (*Mus musculus*);
- Insects (e.g. mosquitoes (*Culicidae*), flies (*Diptera*));
- Feral animals (e.g. pigs (*Sus scrofa*), cats (*Felis catus*), dogs (*Canis lupus familiaris*), foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), etc);
- Native fauna (such as Kangaroos (e.g. *Macropus rufus*) and Wallabies (e.g. *Macropus agilis*);
- Domesticated ruminants (e.g. cattle, sheep and goats); and
- Domesticated pets (e.g. dogs, cats, birds).

The following best practice environmental management procedures for disease vector control will be implemented at the proposed landfill:

- Access restrictions to the landfill site;
- Controlling and monitoring population increase of pests; and
- Minimising exposure of landfill waste to vectors.

#### 4.2.1 Access Restrictions

Access to the landfill by pests and other disease vectors will be controlled by fencing (exclusion) of the site. A perimeter fence will be erected for the site boundary, the active landfill

cells, leachate pond, sedimentation basin, and dry basins. The perimeter fence will be installed in accordance with the specifications provided in the *Landfill Guidelines: Benchmark Technique Number 30 - Security of Site* (EPA, 1996) and in line with the recommendations outlined in the *Pest Management Plan (23464.62586)*.

A lockable security gate will also be installed and maintained. The site gate will be locked outside of normal operational hours, or when the site is unattended. Ingress and egress to the site will only be via the site gate. Further, any existing stock will be permanently removed from the landfill site prior to construction. The condition of the security system will be documented by the Waste Manager on a monthly basis and all amendments made to the system also recorded, including explanatory notes.

#### 4.2.2 Pest Population Control

It is likely that the landfill may become a breeding ground for pests thereby resulting in a population increase. Measures for the minimisation and control of pest and vermin populations are detailed in the *Pest Management Plan* (document reference 23464.62586). In summary, the following will be implemented in line with the *Pest Management Plan* (document reference 23464.62586):

- Adequate surface drainage at the landfill site and immediate surroundings: Standing waters may become potential breeding grounds for insects such as flies and mosquitoes. As such, standing water that is not required for fire or leachate control will be drained appropriately;
- Baiting: A poison program such as use of 1080 poison will be implemented at the site to control or reduce rabbit, foxes, feral cats, and rodents when population densities are medium to high;
- Fumigating burrows;
- Spotlight shootings for advanced control of pests; and
- Trappings for advanced control of pests.

#### 4.2.3 Minimisation of Exposure

Access by vectors to landfill waste will be controlled by minimising exposure of landfill waste. The following exposure minimisation measures will be implemented:

- Compaction of waste: Compaction of waste will be carried out in accordance with *Landfill Guidelines Benchmark Technique Number 24 – Compaction of Waste* (EPA, 1996). The Waste Manager will ensure that maximum compaction is achieved. Waste will be placed in the landfill and compacted, in lift heights of approximately 2 m. The following general conditions apply to landfills receiving:
  - Over 50,000 tonnes of wastes per annum: the waste compaction goal is 850 kg/m<sup>3</sup>, excluding cover material; and
  - Less than 50,000 tonnes per annum: the waste compaction goal is 650 kg/m<sup>3</sup>, excluding cover material.
- Covering of waste: The use of cover material helps to exclude pests such as feral cats, dogs, kangaroos, wallabies and other domesticated stock. Waste will be covered at the end of each day's landfilling activities with virgin excavated natural material and/or alternative daily cover, as approved by writing by the OEH (PAC NSW 2012), and in accordance with *Landfill Guidelines Benchmark Technique Number 33 – Covering of Waste* (EPA, 1996).

### 4.3 Weed Control

Council does not intend to landfill any green waste at the new landfill. Council currently separates green waste as the Long Swamp Road Transfer station and will continue this activity for the new landfill. However, green waste may still find its way to the new landfill through residents and commercial/industrial entities misplacing green waste into the general waste stream. The potential introduction and spread of weeds from the landfill is more likely to be associated with soil disturbance and earthworks during the construction and rehabilitation phases of the landfill operation. Specific weed control measure for the site can be found Section 4 of the *Weed Management Plan* (document reference 23464.62571) and include:

- Vehicle wash down area: A wheel wash facility will be installed close to the landfill face to prevent spread of weed propagules from vehicular movement to and from the landfill facility. All vehicles accessing the site, including customer vehicles, will use the wheel wash facility. The runoff from the wheel wash facility will be contained and weed propagules in wash down effluent disposed of appropriately. Clear signs indicating the wheel wash facility will be installed and displayed to the public at the point of vehicle entry and exit.
- Management of topsoil and plant materials: Topsoil and plant materials imported to the site will be subject to strict inspections to ensure that weeds and other undesirable material are not introduced to biodiversity offset areas and landscape areas. Topsoil will also be re-spread as close as possible to the area it was stripped from.
- Use of herbicides: Noxious weeds will be treated with spot-spraying of glyphosate and thinning/slashing/pulling implemented where required. All use of herbicide will comply with the directions on the attached labelling and with regard to the provisions of the *Protection of the Environment Operations Act 1997*.
- Runoff and drainage systems: Effective drainage of surface water runoff will help capture and prevent the spread of seeds. Drainage systems shall be designed around and along the landfill boundary fence. Runoff shall be captured in the sedimentation ponds to prevent the off-site propagation of any waterborne seeds and weeds (AECOM, 2010).

### 4.4 Landfill Site Management

The landfill site and immediate surrounds will be maintained in a manner which deters the harbourage of pests. The following measures will be implemented:

- Maintenance of a firebreak: A 4 m perimeter firebreak will be constructed and maintained in line with the *Fire Management Plan* (23464.62591). The use of a firebreak will eliminate possible nesting positions for pests, which may include: shrubs, bushes, tree limbs, hollow trees etc.; and
- Stockpiling of waste will not be permitted at the site. Any grass clippings resulting from mowing of facility or cleared vegetation must be managed as recommended in the *Fire Management Plan* (23464.62591)

### 4.5 Immediate Response to Disease Outbreaks

Surveillance of risks to biosecurity will be maintained at the site to ensure diagnosis and early detection of any plant and animal disease outbreaks. Subsequently, any suspected presence of an exotic plant disease or unusual symptoms of plants (adjacent to the landfill), will be immediately reported to the NSW Department of Primary Industries, Exotic Plant Pest Hotline 1800 084 881. Any symptoms or deaths in animals that may be due to an emergency animal disease, will also be reported to the 24 hour hotline Emergency Animal Disease Hotline 1800 675 888. The EPA will also be immediately notified of such incidences.

## 5. Monitoring and Reporting

Site inspections shall be conducted on a monthly basis to monitor environmental performance and compliance with the procedure outlined in this protocol. The site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this protocol; and
- The date and persons involved in the monitoring process.

The Waste Manager is to ensure that appropriate corrective actions are taken within an appropriate time frame to allow for continued compliance with this protocol.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation, in order to adequately assess environmental performance and compliance.

Appendix O of the *Biodiversity Offset Management Plan* (22678.38513) provides a checklist for disease management.

## 6. References

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## **Appendix F.      Pest Management Plan**



~ Commercial-in-Confidence ~

# Pest Management Plan

**Armida Regional Landfill, Waterfall Way**

Report Number 23464.62586



*Prepared for*

*by*

**AECOM<sup>®</sup>**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

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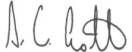

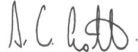
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## **1. Introduction**

This document outlines the Pest Management Plan for the proposed regional landfill facility situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Ltd (EnviroAg) for AECOM Pty Ltd on behalf of Armidale Dumaresq Council (ADC).

This plan details mitigation measures for the management of pests throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation.

This Pest Management Plan aims to encourage best practice environmental management in agreement with the principles of ecological sustainable development.

This plan is a requirement of the Project Approval Section 75J of the *Environmental Planning and Assessment Act 1979* (PAC NSW, 2012).

### **1.1 Objective**

The objective of this Pest Management Plan is to prevent and minimise the spread of pests from the landfill site to adjacent areas.

### **1.2 Document Review**

This Pest Management Plan shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan should include complaints, incidents, monitoring data and the results of any external audit and inspection.

## 2. Identified Potential Impacts

Landfills, being a source of food and refuge, can have the potential to attract and support increased populations of pests including rabbits, rodents, foxes and feral cats. An increase in the population of these animals will have an effect on the surrounding native fauna due to the predatory nature of some of these pests. Preliminary environmental assessments of the project area have identified a large diversity in native fauna and flora, with some of the fauna appearing on both the threatened and vulnerable species lists. These include two threatened woodland birds (Diamond Firetail Finch (*Stagonopleura guttata*) and Speckled Warbler (*Pyrrholaemus sagittata*) and three recently vulnerable listed birds, Scarlet Robin (*Petroica boodang*), Varied Sittella (*Daphoenositta chrysoptera*) and Little Eagle (*Hieraaetus morphnoides*) (EA Systems, 2010).

An increase in the number of feral animals will also have an effect on the adjoining area, with loss of amenity of the surrounding land and an impact on neighbouring produce. Increase of feral animal populations spreading into the Oxley Rivers National Park is of concern to the protected and native species habiting the area. Because of the dangers posed to these species and other native fauna and flora, a pest management plans is required to be acted upon to ensure that these species remain protected and the biodiversity of the area remains intact.

According to the Department of Primary Industries, the rabbit is the most costly and destructive environmental and agricultural vertebrate pest in Australia. In the case of a landfill, rabbits have the potential to destroy the surrounding land, threatening native flora and attracting and promoting fox and feral cat populations (Department of Primary Industries, 2013).

The predatory nature of foxes has been recognised as having a serious impact on native species, and has been linked as the major contributor to the extinction of some animals. Because of this, foxes have been declared as a 'key threatening process'. Foxes are territorial and live in group families. Their territories can range from 2-5 km<sup>2</sup> depending on habitat and food sources.

Insects have the potential to propagate from the operation of a landfill; i.e. mosquitos through standing water, flies through exposed organic material, etc. The control and mitigation of insects at the landfill needs to be considered within the management of pests for the overall health of people accessing the landfill and the surrounding area.

### 3. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 1.

**Table 1:** Roles and responsibilities

Role	Responsibilities
Waste Manager	<ul style="list-style-type: none"> <li>Responsible and accountable for the overall environmental performance of the landfill site and the implementation of this plan;</li> <li>Commit to and lead a positive environmental management culture and challenge ‘at-risk behaviour’;</li> <li>Regularly communicate expectations and ensure workers and others understand and comply with this plan;</li> <li>Undertake the annual review of this document; and</li> <li>Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>Responsible for the implementation of this plan; and</li> <li>Conduct monthly site inspections to monitor environmental performance and compliance with this plan.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>Understand and actively participate in a positive environmental management culture;</li> <li>Identify improvements or initiatives for environmental management; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>

#### 3.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

## 4. Implementation of Controls

The Vertebrate Pest Committee of Australasia (2007) states that the best methods for pest animal control are:

- Killing or removal (e.g. baiting, shooting, trapping or mustering);
- Exclusion (fencing, netting);
- Biological or fertility control;
- Habitat manipulation (removal of surface refuges); and
- Changes in land use including agricultural practices (planting different crops).

The methods described above have been identified as being the most effective ways of controlling populations while meeting animal welfare criteria, with minimal disturbances to native species (Vertebrate Pests Committee, 2007). An overview of mitigation methods and pests targeted can be found in Table 3. The best practice environmental management discussed in this protocol are consistent with the recommendations provided in the *Biodiversity Offset Management Plan* (EA Systems, 2010), the *Landfill Environmental Management Plan* (AECOM, 2010), the *Environmental Guidelines: Solid waste landfills* (EPA, 1996).

Of these proven methods, three (3) are included in the Integrated Rabbit Management Plan (IRMP) for the control and mitigation of rabbits within the project area. According to EA Systems (2010) the minimisation and control of rabbit populations, will have the potential to inadvertently discourage carnivorous pests, such as foxes and cats, whose prey is the rabbit. This method is also supported by the Department of Primary Industries in their publication *Biology, Ecology and Management of Vertebrate Pests in NSW* (Department of Primary Industries, 2013).

### 4.1 Integrated Rabbit Management Plan (IRMP)

The goal of the IRMP is to minimise the environmental damage caused by rabbits by reducing the population to a level where it cannot quickly recover, thereby affectively controlling numbers. The IRMP is a three (3) tier plan and depending on rabbit population densities, will govern the processes and costs associated with management:

#### Step 1 – Initial Reduction:

*Outcome:* To bring the population down to a manageable level.

*Process:* Baiting with 1080 poison or other similar poisoning program.

*Implement:* When population densities are medium to high.

#### Step 2 – Extensive Control:

*Outcome:* To reduce the population down to a level where it cannot recover quickly.

*Process:* Destruction of harbours and warrens through:

- Dismantling of log piles;
- Destruction of blackberry thickets;
- Ripping of warrens; and
- Fumigation of warrens.

*Implement:* When population densities are low.

#### Step 3 – Advanced Control:

*Outcome:* Impede the rebuilding of a population (as long as there is no immigration).

*Process:* Control of mitigated numbers through:

- Spotlight shootings;
- Trappings; and
- Regular and continual monitoring of numbers and warrens.

*Implement:* When rabbit number are low.



Each step outlined above is discussed in more detail in the sections below and will be undertaken depending on the density of rabbit populations in the surrounding area. A procedure to assist with estimating the density of rabbit populations (low, medium or high) can be found in the attached publication *Biology, ecology and management of vertebrate pests in NSW* by the Department of Primary Industries.

The objective of the IRMP is to limit the number of rabbits to a manageable and controllable population. Therefore it is highly recommended that continual monitoring of rabbit numbers, warren formations and droppings should be undertaken monthly within the biodiversity offset area and around the landfill perimeter. This will ensure that overall pest numbers remain at a level where the biodiversity of the area is not affected.

The first two steps of the IRMP (initial reduction and extensive control) must be carried out prior to and during construction, and prior to landfill operations. This includes any baiting, dismantling, destruction and warren ripping. It is therefore critical that baiting be done across the entire proposed landfill area and that extensive control be implemented in preparation for the creation of the biodiversity offset area.

#### 4.1.1 Step 1 - Initial Reduction

If initial rabbit population densities are medium to high (as determined in Appendix B), baiting will be implemented to help bring populations down to manageable levels. Baiting will be carried out using sodium fluoroacetate (1080) poison. Recent studies into Pindone use have shown the poison to harm native fauna, including the vulnerable listed bird, the Little Eagle (*Hieraaetus morphnoides*) which is found in its native habitat around the proposed landfill site (Olsen *et al.* 2013). Because of this issue, baiting using Pindone shall be avoided. Furthermore, baiting shall only occur during non-breeding season. Surrounding paddocks shall be heavily grazed prior to baiting to increase the chances for successful poisoning. Under the guidelines set out in the *Pesticides Act 1999*, only an accredited person with training in chemical use may carry out baiting. The accredited person must carry out baiting procedures set out in the *Pesticide Control (1080 Liquid Concentrate and Bait Products) Order 2010*, which is covered by the *Pesticides Act 1999*.

Before the delivery of poison to the surrounding land, the practice of free feeding will be undertaken. Free feeding is the placement of non-poisoned food such as carrots and oats. The intention of this practice is to attract and de-sensitise the rabbits to 'strange food'. Free feeding will also increase the accuracy in determining the quantity (that is, number of baits used) and spatial distribution of poison. This will result in maximum knockdown with minimum baits left untouched. Free feeding will be carried out with conditions set by an authorised control officer (ACO) who is consulted on a best practice baiting program. During free feeding the amounts of feed placed may vary, and amounts should be increased if all previous feed was taken and decreased if feed was left untouched. The suggested amounts of feed spread during free feeding will be dependent on the determined densities and method of dispersion. These amounts can be found in the attached publication. Baiting with 1080 poison will follow directly after successful completion of free feeding. The interval for baiting will be determined on the type of bait used and method of dispersion.

Types of dispersion methods will depend on the size of the baiting area, ease of access to the area and population of pests present. Methods include trailing, hand broadcasting and aerial and mechanical ground broadcasting. Processes and procedures for these methods can be found in the attached publication.

#### 4.1.2 Step 2 - Extensive Control

The second step in the IRMP is extensive control, where harbour and warrens are dismantled or destroyed. Extensive control is the most important step in the management of rabbits due to its effectiveness in reducing the population to a level where it cannot recover quickly.

Dismantling of log piles and the removal of blackberry thickets from the surrounding land will be undertaken to discourage pests from harbouring and recolonising. Log piles will be dismantled with individual logs being dispersed throughout the offset area to emulate natural conditions (Munro *et al.* 2009). Blackberry thickets will be destroyed in accordance with the *Weed Management Plan* (23464.62571).

Warren ripping is another method for the destruction of rabbit burrows. It uses tractor mounted 'rippers' for the excavation of warrens. Since rabbits do not readily dig new warrens, this method is a good way of discouraging re-infestation through large clearings of warrens. It will however have an adverse impact on the surrounding environment due to large areas of surface and subsurface destruction arising from the process. Therefore due to the high impact and costs associated with ripping, it is highly recommended that this method only be used when rabbit densities are in plague proportions. It is also highly recommended that this control method only be undertaken on a limited scale and when all other avenues of control are exhausted. The disruption of soils due to warren ripping will result in the loss of vegetation, and may also lead to uncontrolled erosion. Re-vegetation of these areas must be of priority. Prior checks of warrens must also be undertaken before ripping to ensure that no native species are utilising the abandoned warrens. If ripping is undertaken then a plan detailing ways to mitigate the environmental impact on the treated area shall be undertaken. The plan shall incorporate an erosion and sedimentation control plan and a vegetation re-habitation plan, and shall need to be approved by the EPA. The attached publication, *Biology, ecology and management of vertebrate pests in NSW* by the Department of Primary Industries details the different techniques for warren ripping with tractor mounted rippers. With limited warrens, simple hand excavations using shovels or picks are just as effective (Department of Primary Industries, 2013).

In the case where rabbit warrens are inaccessible or in environmentally sensitive areas, and where all other areas of extensive control are not permitted, fumigation of warrens may be undertaken as an alternative method. Fumigation uses aluminium phosphide pellets, which when in contact with moisture, releases phosphine gas, which is highly toxic to rabbits. Phosphine gas is lethal to all animals, including humans, therefore extreme care must be taken and correct PPE must be used during fumigation. The attached publication details the techniques for fumigation of rabbit warrens. Fumigation using aluminium phosphate will only be used as a limited and strategic control method when all other alternative methods for extensive control have been exhausted. The person distributing aluminium phosphide must have appropriate training at Level 3 of the Australian Qualifications Framework (AQF) (WorkCover, 2010).

#### 4.1.3 Advanced Control

Advanced control is the continual monitoring and control of populations through the elimination of individual rabbits. Advanced control is carried out through spotlight shootings and trapping. Shootings must be undertaken by licenced personnel and be undertaken in a humane way to reduce the risk of suffering to the animal. Trappings are permitted under the *Rural Lands Protection Act 1998*. It should only be carried out during the advanced control step and be implemented only to catch any remaining rabbits. Traps may be placed around areas of suspected activity including entrances to rabbit warrens, along fence lines and on top of dung heaps. All traps must be checked and deactivated each morning after setting to reduce unnecessary suffering to any captured rabbits, and to stop any trapping of non-targeted animals (Department of Primary Industries, 2013).

## **4.2 Mitigation of Foxes, Cats, Pigs and Rodents**

Successful implementation of the IRMP is an effective process for mitigating and discouraging carnivorous pests (Department of Primary Industries, 2013). It is not however full proof and other methods may need to be addressed to directly control these other pests.

### **4.2.1 Foxes**

Due to the large spread in which a small group of foxes will colonise, as well as the inherent ability for foxes to rapidly establish new territories over short or long distances, no single control method will be an effective mitigation measure. A combination of baiting, shooting and trapping, along with successful implementation of the IRMP has been proven to be best practice for the mitigation and control of foxes.

#### **4.2.1.1. Baiting**

Before baiting is to be carried out, an assessment of fox numbers will need to be conducted. Monitoring techniques can be found on the Department of Primary Industries website. Part of this assessment will be to determine the effectiveness of the IRMP in the control of rabbit numbers and the subsequent control of fox numbers. Only if the IRMP has had no impact on fox numbers, and the population has increased will a fox mitigation strategy be undertaken.

Baiting of foxes will be done with 1080 poison. This poison is most effective during the autumn and spring months when local livestock is young and other threatened species are at their most vulnerable state (Department of Primary Industries, 2013). Focused baiting around a small area will not be an effective method of control due to the fox's territorial habits to migrate from untreated areas to non-colonised areas within a period of 2 to 6 weeks. The most efficient way to reduce the impact of foxes is therefore to conduct a strategic and simultaneously coordinated poisoning program that is spread over a number of land holdings. This will effectively target a larger radius and discourage foxes migrating and inhabiting the lands around the landfill. The attached publication describes a method for effective baiting of foxes.

#### **4.2.1.2. Shooting**

Shooting is another mitigation method for the control of fox numbers. Shooting, with a high calibre gun and telescopic sights may be undertaken during the advanced control step of the IRMP. Shooting will again be engaged by licenced personnel and be undertaken in a humane way to reduce the risk of suffering to the target animal.

#### **4.2.1.3. Trapping**

Trapping is also an effective method at an advanced control step for the control of fox numbers. All traps that are set shall be checked after 24 hours to ensure that any non-targeted animals are released with minimum distress. All foxes that are trapped will be humanely euthanized by a qualified vet or pest management expert.

### **4.2.2 Feral Cats**

The most commonly used techniques for the control of feral cats are shooting, baiting and trapping.

#### 4.2.2.1. *Shooting*

Shooting is the most appropriate control technique of feral cats, if applied for an extended period. Opportunistic shooting in conjunction with shooting of rabbits and foxes, may be an effective method of feral cat control, depending on numbers and spread (DEWHA, 2008).

#### 4.2.2.2. *Baiting*

Although baiting is the cheapest and most effective widespread technique, baiting of feral cats has been observed to be far less effective than the techniques for baiting of rabbits and foxes. This is due to the fact that feral cats are often found in low densities with large territories and are naturally wary of decaying meats (which is the carrier of 1080 for baiting of carnivorous pests) (Saunders & Sharp, 2005). Opportunistic baiting of feral cats should be undertaken during baiting of rabbits and foxes. Continual monitoring of feral cat numbers should be carried out and any sudden rise in numbers shall warrant a full baiting process.

#### 4.2.2.3. *Trapping*

Trapping may also be used as a control method and any cats that are trapped will again be humanely euthanized by a qualified vet or pest management expert.

#### 4.2.3 *Feral Pigs*

Feral pigs are also considered as pests as they destroy native flora, displacing native fauna, and are carriers of disease. Although not common to the site area, the introduction of a landfill may attract and promote pig populations. Mitigation measures will include:

- Continual monitoring for signs of pigs in conjunction with monthly surveys of other pest numbers;
- Fencing and efficient covering of waste; and
- If pigs are observed then a baiting program may be implemented. An authorised control officer will be consulted if baiting is required. Opportunistic shooting may also be a viable option for the mitigation of feral pigs.

#### 4.2.4 *Rodents*

Rodents can become a nuisance if not controlled correctly. The most effective rodent control includes continual maintenance and daily covering of waste. If rodent numbers become uncontrollable then a baiting strategy may need to be developed and a professional pest controller should then be consulted.

### 4.3 **Bird Mitigation**

Both pest and native birds have the potential to be nuisances to the operations of the landfill and may be a vector for the spread of disease. Mitigation measures will include:

- Efficient covering of waste; and
- Bird scare, however this should be a last resort as the continual noise may impact on native birds in neighbouring areas that may not be a nuisance to the landfill.

#### 4.3.1 *Noisy Miner*

Noisy Miners have been listed as a Key Threatened Process for some species of threatened birds, under the *Threatened Species Conservation Act*, 1995. Noisy Miners (*Manorina melanocephala*)

are an increasing problem in Australian landscapes and dominate small patches and aggressively exclude other small woodland birds (Ford *et al.* 2001). Noisy Miners can form large complex colonies of up to several hundred individuals which cooperate in most activities including breeding and territory defence. Noisy Miners tend to dominate the habitat they occupy often comprising more than 50% of all birds present in fragmented woodland and open forest. Through their cooperative aggressive behaviour, Noisy Miners physically attack and actively drive away birds of similar or smaller size from areas they occupy. This aggressive exclusion often results in Noisy Miners being the only small-medium sized bird species present in occupied habitat.

The establishment of shrubs, such as native Acacias, in the offset woodland may reduce the number of Noisy Miners (Hastings & Beattie 2006). In a study by Hastings and Beattie (2006), the greatest abundance and richness of small birds occurred in plantings combining eucalypts with at least 15% Acacias. Hastings and Beattie (2006) recommend that eucalypt plantings be supplemented with both Acacias (preferably bipinnate) and a shrubby understorey to deter Noisy Miners. Although there are no legislative requirements associated with control of the Noisy Minor, Noisy Miners have been listed as a Key Threatened Process for some species of threatened birds, under the *Threatened Species Conservation Act*, 1995.

#### 4.4 Insect Mitigation

Invertebrate pests include flies, mosquitos and bees. These pests can harbour disease and become a nuisance to workers and others, and may have the potential to threaten native fauna and flora. Insect mitigation at the landfills will include:

- Daily covering and compaction of waste with soil or alternative such as spray sealant or tarp technology; and
- All ponding of water will be avoided with controlled drainage of surface water. Where required, controlled pesticide sprays will be used to destroy outbreaks.

Landfills may also be a source of food for exotic bees. The increase in bee populations may have the potential for impacting on some of the management processes outlined in the *Biodiversity Offset Management Plan* (AECOM, 2010). One such potential impact may be the displacement of native species from artificial nest boxes due to the invasion and harbouring of exotic bees (EA Systems, 2010). Exotic bees are listed as a key threatening process to the conservation of the threatened Little Lorikeet (*Glossopsitta pusilla*) and the threatened Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), which have been observed adjacent to the site and will compete against the exotic bees for resources. Mitigation measures for controlling exotic bee populations include:

- Six (6) monthly inspections of the artificial nest boxes should be carried out to determine whether any pest such as exotic bees have taken up residence. If the bees are undermining the procedures set out in the BOMP then mitigation measures will need to be addressed including the removal of beehives by a specialised consultant.

#### 4.5 Domesticated Animals

The potential for disease spread to and from the landfill is of issue and as such all domesticated animals shall not be allowed onsite.

#### 4.6 Kangaroos and Wallabies

Native animals such as kangaroos and wallabies may also be attracted to the landfill as a source of food. They are also a possible vector for disease and therefore must be deterred from entering the area. Mitigation measures will include:

- The creation/erection of an exclusion fence of a minimum height; and
- Effective covering of waste shall also be applied.

#### 4.7 Landfill Maintenance

Landfill cleanliness and maximising waste coverage have proven to be highly effective deterrents from scavenging pests. Continual compaction and coverage of waste with soil to a minimum depth of 150 mm or with OEH approved spray seal and tarp technologies during operations will minimise the amount of exposed waste. This is in accordance with *Landfill Guidelines: Benchmark Technique Number 33 – Covering of Waste* (EPA, 1996). Additional effort will be required in the case of large loads of organic waste entering the site. This may include the direct disposal and coverage of the waste as a priority. Capped cells will need continual monitoring for warrens. Adequate drainage and prevention of ponding will help mitigate insect and rodent propagation.

#### 4.8 Exclusion Fencing

Of all the pest control strategies discussed, exclusion fencing is regarded as the most humane and effective method for control and mitigation. Erecting a barrier between the proposed landfill site and its surrounding land will impede and discourage feral animals from scavenging and may even prevent them from harbouring in the area. Fencing must be constructed around revegetation and regeneration areas to exclude rabbits, foxes and cats (along with livestock), with the aim of minimising grazing, land degradation and predation pressures upon native flora and fauna species and communities. Fencing will also discourage after hours dumping of waste.

It is important to design and construct the fence in a way which is specific to the behaviour of the animal which the fence aims to exclude. The design shall be within minimum standards described in the *Landfill Guidelines: Benchmark Technique Number 30 – Security of Site* (EPA, 1996) and conditions for effectively inhibiting target pests including rabbits, foxes and feral cats, from entering the waste site (see Table 2). The guidelines state that a security fence must be a minimum height of 1.8m. Foxes and feral cats have been observed to be able to jump to a height of 1.8m. Therefore a fence height greater than 1.8m is required to effectively mitigate pests and to meet security requirements for landfill operations. Security fencing will be constructed in accordance with Australian Standards (AS 1725). The use of barbed wire shall be avoided to prevent physical harm and entanglement of animals that may come in contact with it.

For a fence to be long term effective it must also be monitored and well maintained, with a vehicle track cleared on one side to enable easy access. In heavily treed areas, overhanging branches should be removed by a suitable qualified person to minimise damage to the fence in strong winds/storms. Routine monitoring and maintenance of the barrier fence should be undertaken monthly to check for burrows and any disturbances within the fence that may allow for passage of pests into the offset areas and landfill.

**Table 2:** Minimum fencing criteria for effective exclusion of pests

Conditions	Foxes	Feral Cats	Rabbits
Minimum fence height	>1800 mm	>1800 mm	>900 mm
Maximum mesh size	<80 mm	<50 mm (less for kittens)	<30 mm
Digging ability	Good	Unknown	Excellent
Climbing ability	Excellent	Excellent	Capable of climbing
Reaction to electrification	Deterred by electric shocks but may learn to avoid these	Variable response	Electric wires may deter rabbits from digging beneath the fences
Optimal spacing between electric wires	70 – 90 mm when offset from netting fences	80 mm when offset from netting fences	N/A
Other attributes	Can chew through plastic mesh		Can chew through plastic mesh

#### 4.9 Implementation of Controls Summary

Prevention is the most effective management strategy. This will include effective landfill operations and continual monitoring to reduce the chances for potential impacts on the biodiversity of the area. Below are the main strategies for successful implementation of the pest management plan and the successful control of pests.

- Assessment of rabbit, fox and feral cat populations must be undertaken prior to construction and during operation of landfill. This will allow for the determination of the most effective strategy to be implemented in this management plan;
- Continual monitoring of targeted pest numbers to identify effectiveness of management plan. Monitoring will also assess whether propagation is occurring thus allowing for quick action in preventing outbreaks;
- Initial and continual monitoring of surrounding biodiversity to ensure that pest control measures are not affecting native flora and fauna;
- Initial consultation with a pest expert or the LHPA to implement the most effective pest management strategy including baiting frequency and locations;
- The IRMP will be the primary strategy. Effective implementation of the plan may inadvertently control the number of foxes and feral cats colonising the area. This will be the most cost effective method for direct control of pests if successful;
- Baiting be carried out across the entire proposed area and that extensive control be implemented in preparation for the creation of the biodiversity offset area;
- Harbour destruction including the dismantling of log piles and the destruction of blackberry thickets and warrens;
- Fox baiting to be carried out as a strategic and simultaneously coordinated poisoning program that is spread over a number of surrounding land holdings;
- Shooting be undertaken at an advanced control level to control rabbit numbers and to allow for the opportunistic eradication of foxes and feral cats. Shootings will be undertaken by suitable qualified persons and that all measures will be undertaken to minimise suffering to target animals;
- The continual compaction and daily covering of waste with a minimum of 150 mm depth of soil or OEH approved spray sealant or tarp technology to minimise the amount of exposed waste. This is within the environmental guidelines for solid waste landfills set by the EPA (EPA, 1996);
- Designed drainage around cells to maximise runoff and minimise pooling of liquids; and
- Pest-proof fence be erected around the landfill to discourage scavenging and eventual colonisation around the site.

Table 3 provides an overview of mitigation strategies for targeted pests.

**Table 3:** Overview of mitigation strategies and their targeted pest

Mitigation Strategy	Target Pest							Implementation		Responsible Person	Notes
	Rabbits	Foxes	Feral Cats	Rodents	Mosquitos	Flies	Exotic Bees	Construction	Operation		
Baiting	X	X	X	X				X	X	Pest Control Officer	Baiting success should be determined by the difference in populations before and after poisoning. Monitoring of native species also needs to be undertaken to ensure that the procedure is not harming non-targeted animals.
Harbour Destruction	X	X	X					X		Bushland Regenerator	Harbour destruction is a critical phase in the mitigation plan and if implemented successfully will limit the chances of propagation.
Shooting	X	X	X					X	X	Licensed Shooter	Shooting can be an effective tool for controlling numbers.
Trapping	X	X	X					X	X	Pest Control Officer	Trapping is only undertaken at a final stage to remove any remaining pests.
Pesticides					X	X	X		X	Pest Control Officer	Pesticides may be used to control the outbreak of flies and mosquitos and to deter bees from harbouring in offset biodiversity areas.
Waste Compaction and Coverage	X	X	X	X	X	X	X		X	Operations Manager	Efficient compaction and coverage is part of the environmental guidelines set by the EPA for Solid Waste Landfills (1996).
Drainage of Surface Water				X	X	X	X		X	Environmental Officer	Designed runoff systems are an effective preventative measure for the control of mosquitos.
Exclusion Fencing	X	X	X					X		Operations Manager	Indications include droppings, sightings, evidence of scavenging, and disturbance in the fence.



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## 5. Monitoring and Review

Initially, site inspections shall be conducted on a monthly basis to monitor environmental performance and compliance with the mitigation measures outlined in this plan. The site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this plan; and
- The date and persons involved in the monitoring process.

The Waste Manager is to ensure that appropriate corrective actions are taken within an appropriate time frame to allow for continued compliance with this management plan.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation, in order to adequately assess environmental performance and compliance.

Determination of the effectiveness of the mitigation measures can be accomplished through the assessment of changes in pest numbers before and after implementation. Monitoring will also assess whether propagation is occurring thus allowing for quick action in preventing outbreaks.

Monitoring should also be carried out on native wildlife before and after implementation of the mitigation measures. This can help ascertain whether any control techniques are indirectly impacting the native wildlife of the surrounding area. Monitoring should follow the flora and fauna assessment and indicate any adverse changes in numbers and any deaths that may have resulted from the control techniques. This will assist with the management of any adverse impacts and improve techniques for more successful mitigation strategies.

Routine monitoring and maintenance of the barrier fence should be undertaken monthly to check for attempted burrows and any disturbances within the fence that may allow for passage of pests into the landfill.

Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for pest management.

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## **Appendix G. Fire Management Plan**

~ Commercial-in-Confidence ~

# Fire Management Plan

**Armida Regional Landfill, Waterfall Way**

Report Number 23464.62591



*Prepared for*

*by*

**AECOM<sup>®</sup>**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

# Document Status Record





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## **1. Introduction**

This document outlines the Fire Management Plan (FMP) for the Armidale Regional Landfill situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Ltd (EnviroAg) for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This FMP details measures for mitigating and reducing risks associated with uncontrolled bushfires throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation.

This FMP aims to encourage best practice environmental management in agreement with the principles of ecological sustainable development.

This FMP is a requirement of the Project Approval (PAC NSW, 2012) under Section 75J of the Environmental Planning and Assessment Act 1979 (Appendix A - Statement of Commitment, point 17).

A pollution incident response management plan (PIRMP) will be developed for the landfill. The PIRMP will be required to specify the relevant local emergency response agencies, their precise contact details and how and when they will be contacted. Additionally, the PIRMP will detail specific actions to be conducted in the event of a fire.

### **1.1 Objective**

The objective of this FMP is to prevent and minimise adverse impacts on flora and fauna from uncontrolled bushfires.

### **1.2 Document Review**

This FMP shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan should include complaints, incidents, monitoring data and the results of any external audit and inspection.



## 2. Identified Potential Impacts

Uncontrolled bushfires may result from landfill activities during construction, operation and rehabilitation, or originate off site or by lightning strike in the offset areas. There are two fire seasons in the region of the proposed landfill. The first season extends from August to November and is associated with the dry westerly winds. The second season extends from February to April and is associated with the high summer temperatures.

Electrical storms are common in January and February, and frosts during June and July cause curing of summer and autumn grasses. Uncontrolled bushfires may result in temporary loss of habitat and thereby affect the viability of local populations of threatened flora and fauna species. Landfill activities that may pose significant risk for uncontrolled bushfires include:

- Native vegetation clearing;
- Stockpiling of cleared vegetation on-site;
- Unauthorised flammable liquids brought on-site;
- Storage tanks/drums of flammable liquids on-site;
- Operational use of fuels of flammable solvents on-site;
- Stockpiling of combustible materials on-site;
- Open landfill;
- Gas emissions at the landfill; and
- Smoking on site.

### 3. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 1.

**Table 1:** Roles and responsibilities

<b>Role</b>	<b>Responsibilities</b>
Waste Manager	<ul style="list-style-type: none"> <li>Responsible and accountable for the overall environmental performance of the landfill site and the implementation of this plan;</li> <li>Commit to and lead a positive environmental management culture and challenge 'at-risk behaviour';</li> <li>Regularly communicate expectations and ensure workers and others understand and comply with this plan;</li> <li>Undertake the annual review of this document; and</li> <li>Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>Responsible for the implementation of this plan; and</li> <li>Conduct monthly site inspections to monitor environmental performance and compliance with this plan.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>Understand and actively participate in a positive environmental management culture;</li> <li>Identify improvements or initiatives for environmental management; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>Immediately report incidents and unsafe conditions.</li> </ul>

#### 3.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site. Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

Personnel involved in supervising fuel management activities will receive the appropriate level of training to attain the necessary skills and competences to be able to interpret fire, fuel, weather and fire danger indices. As part of landfill operator training, operators are trained to inspect loads at the tipping face for any flammables, sealed containers or drums. Additionally, operators are trained in the use of heavy machinery to pull burning material apart or to smother it with inert material. Landfill employees shall undergo a fire training refresher course every two years, which shall cover fire fighting tactics using the most appropriate method.

## 4. Implementation of Control Measures

Measures for mitigating and reducing risks associated with uncontrolled bushfires that may result/originate from activities during the lifetime of the landfill and/or offsite are consistent with the controls provided in the *Biodiversity Offset Management Plan* (EnviroAg, 2013), the draft *Landfill Environmental Management Plan* (AECOM, 2010) and the *Environmental Guidelines: Solid waste landfills* (EPA, 1996). Mitigation measures for fire prevention, control and mitigation measures are discussed in sections 4.1 to 4.14.10 and include:

- Provision of adequate signage on operations and prohibitions;
- Waste reduction;
- Screening of waste;
- Compaction of waste;
- Fuel load reduction;
- Fire hazard reduction;
- Covering of waste;
- Control of landfill gas;
- Provision of adequate fire fighting capacity; and
- Maintenance of a perimeter firebreak.

### 4.1 Provision of Adequate Signage

The following measures will be implemented:

- Clear signs will be displayed on all storage tanks/drums of flammable liquids required for the operation of the landfill (e.g. diesel storage tank for the on-site machinery);
- Clear signs will be displayed advising that smoking is prohibited within the landfill site compound;
- Contact numbers for the NSW Fire Brigade and NSW Rural Fire Service, local police and emergency services will be clearly posted at the site office and within the Pollution Incident Response Management Plan (PIRMP); and
- Fire fighting equipment will be clearly signposted and access ensured at all times.

### 4.2 Waste Reduction

Waste reduction will be achieved at the current Armidale Waste Management Facility, located on Long Swamp Road, through separation. Only waste that cannot be reused, recycled or composted will be transported to the approved landfill. Recycling of landfill waste will be implemented in accordance with *Landfill Guidelines Benchmark Technique Number 25 - Recycling* (EPA, 1996). All green waste collected by Council will continue to be mulched at the existing landfill at the Armidale Waste Management Facility and made available for re-use. As noted in section 4.1a, green waste will not be disposed of in the proposed landfill, except whenever significantly contaminated loads of materials are collected (i.e. contaminated by the inclusion of a proportion of “foreign” or otherwise non-compostable matter/objects by individuals/residents)

Other waste education programs by Armidale Dumaresq Council will continue to be implemented to reduce overall waste to the landfill. These include the City to Soil program for the composting of organic waste.

### 4.3 Screening of Waste

Waste accepted at the new landfill facility will be screened at the current Waste Management Facility (transfer station), located on Long Swamp Road, prior to being transported to the new landfill. This will ensure that unauthorised waste, e.g. flammable liquids, car tyres, drums, batteries, etc., will not be transported to the new landfill. Sealed containers will not be accepted at the site unless delivered as a special waste where the contents are clearly identified and suitable for acceptance.

Council has made a commitment, under the drumMUSTER program, to organise a collection site (transfer station) and run collections for chemical users / farmers to drop off their empty clean containers for inspection. The aim of the program is to encourage the chemical users / farmers to use the program and make rinsing their containers common practice.

The drumMUSTER program provides a range of environmental, economical and social benefits to the chemical user and the community as a whole. They include a safe, cost effective solution to the disposal problem of empty containers, and the production of a valuable recyclable commodity.

### 4.4 Compaction of Waste

The waste disposed at the landfill will be compacted in order to minimise voids—to avoid gas accumulation that increase risk of fires—as well as to maximise the capacity of the landfill. Compaction of waste will be carried out in accordance with *Landfill Guidelines Benchmark Technique Number 24 – Compaction of Waste* (EPA, 1996). The Waste Manager will ensure that maximum compaction is achieved. Waste will be placed in the landfill and compacted, in lift heights of approximately 2 m. The following general conditions apply to landfills receiving:

- Over 50,000 tonnes of wastes per annum: the waste compaction goal is 850 kg/m<sup>3</sup>, excluding cover material; and
- Less than 50,000 tonnes per annum: the waste compaction goal is 650 kg/m<sup>3</sup>, excluding cover material.

### 4.5 Fuel Load Reduction

Fuel load (referring to the amount of flammable material) reduction strategies that may be implemented at the site include:

- Controlled burning of vegetation within the landfill site boundary (excluding the landfill cells and areas directly adjacent); and
- Slashing and clearance/removal of vegetation adjacent to the landfill cells.

#### 4.5.1 Controlled Burning

Controlled burning may be carried out within the landfill boundary (excluding active cells and areas directly adjacent) to minimise the occurrence and impact of uncontrolled fires. However, controlled burning will only be carried out following written permission from the EPA. Controlled burning must be undertaken in accordance with any specific conditions stipulated by the EPA. Additionally, permission to carry out controlled burning will be sought from the National Parks and Wildlife Service and other local government fire service authorities which include the NSW Fire Brigade and NSW Rural Fire Service.

Any burning on site will comply with the provisions outlined in the *Landfill Guidelines Benchmark Technique 13 - Controlled Burning* (EPA, 1996), which include but are not limited to:

- The operations manager or their delegate will supervise all controlled burning on site;
- Burning will only be conducted during daylight hours;
- A 50 m buffer zone will be maintained between the area to be burned and the site perimeter, as well as the other active landfill areas;
- Burning will only be carried out in appropriate weather conditions; and
- Hazard reduction burning in offset areas will not be permitted in line with OEH requirements for offset areas.

#### 4.5.2 Slashing

Slashing of grass adjacent to the landfill will be carried out to minimise the amount of vegetative fuel load within the landfill footprint area and around the perimeter of the biodiversity offset areas.

### 4.6 Fire Hazard Reduction

The following fire hazard reduction strategies will be implemented:

- Grass cuttings or cleared vegetation from within the landfill site will not be disposed in the landfill;
- Fuel tanks and any other flammable liquids required for the operation of the landfill will be stored within designated areas, away from the landfill area;
- Flammable liquids for operational use will be stored within a bunded area, of 110% capacity of the volume of the liquids stored so that any release of raw or burning fuel is contained; and
- The Waste Manager will ensure non-accumulation of exposed waste.

### 4.7 Covering of Waste

Covering of waste will be implemented at the landfill in accordance with the *Benchmark Technique Number 33 – Covering of Waste* (EPA, 1996). The use of cover material helps to control and minimise the risk of fire, as well as minimise emissions of landfill gas. Briefly, cover material is classified as daily, intermediate or final depending on operation phase and function. Intermediate cover is used to close off a cell that will not receive additional lifts of refuse or final cover for some time. Final cover forms a low permeability barrier to control water entering the site and gas emissions, and to promote revegetation. Where cover material cannot be won on-site, a cover stockpile will be maintained in accordance with the site's LEMP. Where all cover material must be provided from a stockpile, a two-week supply should be maintained. As a guide, this is estimated to be one cubic meter of cover for every six tonnes of waste received.

The following measures will be implemented:

- Covering of waste at the end of the day's activities with 150 mm of cover material approved by OEH or alternative daily cover (such as spray sealing or tarp technologies) as approved by OEH;
- Removal or puncturing of daily cover prior to placement of additional waste;
- An intermediate cover will be applied to a depth of 30 cm over surfaces which will be exposed for more than 90 days;
- Removal or puncturing of intermediate cover prior to placement of additional waste; and
- Maintenance of a sufficient cover stockpile accordance with AECOM (2010).

#### 4.8 Control of Landfill Gas

Landfill gas will be contained in accordance with *Landfill Guidelines Benchmark Technique Number 10* (EPA, 1996), or other benchmark techniques including:

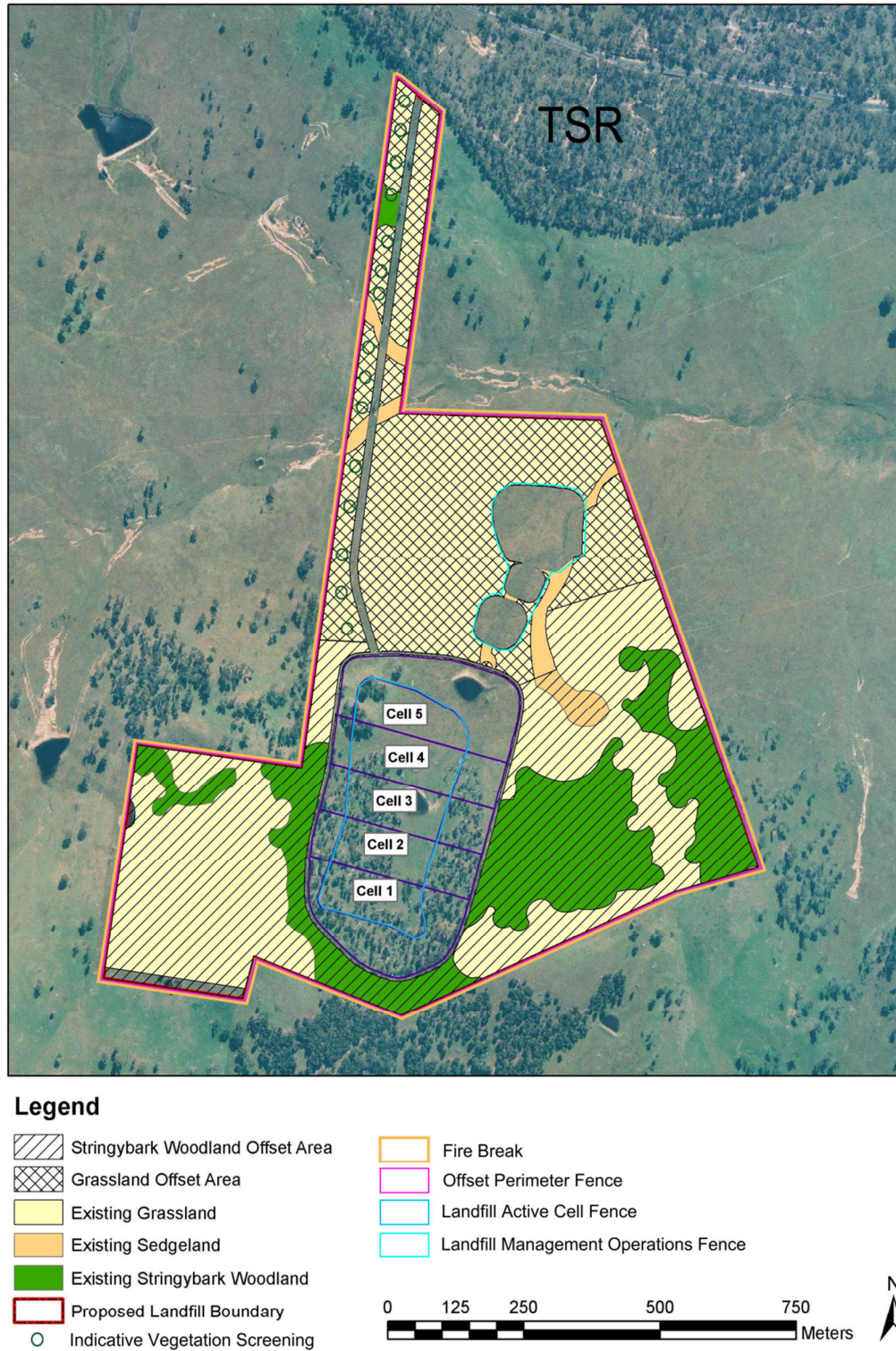
- Leachate barrier system (*Landfill Guidelines Benchmark Technique Number 1- Leachate Barrier System* (EPA, 1996));
- Site capping and revegetation (*Landfill Guidelines Benchmark Technique Number 28 - Site Capping and Revegetation* (EPA, 1996)); and,
- Covering of waste (*Landfill Guidelines Benchmark Technique Number 33 – Covering of Waste* (EPA, 1996))

The Waste Manager shall nominate one of the above systems and implement at the site.

The extraction and disposal of landfill gas will be implemented in accordance with *Landfill Guidelines Benchmark Technique Number 11- Extraction and Disposal of Landfill Gas* (EPA, 1996) and monitoring of landfill gas conducted in accordance with *Landfill Guidelines Benchmark Technique Number 17 - Subsurface Gas Emission Monitoring* and *Landfill Guidelines Benchmark Technique Number 18 – Gas Accumulation Monitoring* (EPA, 1996).

#### 4.9 Perimeter Firebreak

A 4 m perimeter firebreak will be constructed and maintained between the landfill cell fence and offset areas in order to minimize bushfire hazards. A second perimeter break will be constructed around the perimeter of the offset areas (Stringybark woodland and grassland) (refer to Figure 1). Furthermore, appropriate firebreaks will be maintained around gas extraction equipment and site buildings. Where the preparation of fire breaks is to involve burning, approval will be obtained from the relevant authority as mentioned in section 4.5.1. Further, the perimeter firebreak will be constructed to the satisfaction of the relevant fire authority.



**Figure 1. Location of fire breaks, fences and offset areas for the approved landfill facility.**

Note 1: Location of landfill active cell fence and landfill management operations fence may change dependent on detailed design for the site.

Note 2: The landfill active cell fence will be dynamic and the area it surrounds will change based on active cells.

## 4.10 Fire Fighting Equipment

Fire fighting equipment will be implemented in accordance with *Landfill Guidelines Benchmark Technique Number 38 - Fire Fighting Capacity* (EPA, 1996). Furthermore, the following actions shall be observed:

- Fire management training to be provided to people regularly accessing the site, with a refresher course conducted every two years; and
- Fire fighting preparedness (refer to PIRMP).

### 4.10.1 Fire Management Training

Workers and others frequently accessing the site shall undertake fire fighting training as per the *Landfill Guidelines Benchmark Technique Number 39 – Staffing and Training Requirements* (EPA, 1996) and the site PIRMP. The fire management training shall ensure that:

- Landfill staff acquire adequate landfill fire-fighting techniques;
- All landfill operators hold the appropriate qualifications and experience to undertake their specific tasks;
- Workers and others operating gas testing equipment are familiar with the required testing and sample retention protocols to a standard approved by the NSW Environment Protection Authority (EPA);
- Workers and others responsible for the inspection and/or direction of waste placement are skilled to identify prohibited wastes and accurately record data;
- Workers and others are adequately trained to recognise and handle hazardous or other unapproved wastes; and
- Workers and others responsible for the compaction of waste are trained in the required waste compaction procedures.

### 4.10.2 Fire Fighting Preparedness

The following fire fighting preparedness strategies will be implemented:

- As part of the site's PIRMP, appropriate fire fighting equipment shall be maintained and tested in accordance with the manufacturers' recommendations;
- A maintenance schedule for all fire-fighting equipment and facilities will be maintained by the manager or their delegate and clearly displayed;
- Details of all fire fighting equipment accessible on-site shall be maintained in a site register;
- The water contained in the sedimentation basin maintained at the site will be used for firefighting in the event of a fire.
- A stockpile of clean cover material will be located in a designated area and will be used to smother fires if needed.
- The PIRMP, with details of procedures which will be carried out in the event of a fire at the landfill, will be implemented and maintained by Council. Briefly:
  - The NSW Fire Brigade and NSW Rural Fire Service will be contacted immediately and informed of the nature and location of fire.
  - The local authorities (Police) and emergency services (Ambulance, State Emergency Services) will be contacted immediately and informed of the nature and location of the fire.
  - If it is safe to do so, actions will be taken to control/extinguish the fire. Actions may include, use of fire extinguishers, pumping of water from basins, use of water cart and the covering of fire with dirt and/or soil.



## 5. Monitoring

The Waste Manager or their delegate shall patrol the site on a daily basis to ensure compliance with the requirements of this plan. The inspection shall note any observed fire risks and ensure correct placement of waste at the site.

Furthermore, performance and compliance with the mitigation measures outlined in this plan will be formally monitored on a monthly basis. The site inspections shall be conducted by the Waste Manager or their delegate and report on the following:

- Non-conformances with this plan; and
- The date and persons involved in the monitoring process.

The Waste Manager is to ensure that appropriate corrective actions are conducted by site personnel routinely to allow for continued compliance with this management plan.

The frequency of the site inspections may need to be altered throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation, in order to adequately assess environmental performance and compliance.

Appendix O of the *Biodiversity Offset Management Plan* (22678.38513) provides a checklist for fire management.

### 5.1 Reporting

Landfill performance will be reported as required by the site EPL. The following standard reporting procedures shall be observed:

- Any incident occurring onsite will be reported as stipulated by the site's PIRMP. Incident reporting will include details on:
  - Any fire incidents at the landfill, either surface or subsurface that represent a threat to the environment. This will be reported as soon as practicable within three hours of the incident first being identified. Initial contact will be made via EPA's 24-hour pollution Line and a written notice will follow within 14 days; and
  - The presence of hazardous wastes such as non-domestic wastes amounting to more than 200 mL/tonne or 200 g/tonne in accordance with *Landfill Guidelines Benchmark Technique Number 21- Screening of Wastes Received* (EPA, 1996) and details of the responsible person, if known.
- Preparation and provision of an annual report as part of the annual licence renewal application. The report will include details on:
  - Landfill gas emissions demonstrating achievement of relevant environmental objectives listed in the *Landfill Guidelines Benchmark Technique Number 10 – Landfill Gas Containment System and Landfill Guidelines Benchmark Technique Number 11- Extraction and Disposal of Landfill Gas* (EPA, 1996) within the past 12 months;
  - All fires recorded on site. Details on weather conditions, activities undertaken on site during fire outbreak, as well as the probable cause and mitigation measures implemented; and
  - The achieved compaction rate (excluding cover material) in compliance with *Landfill Guidelines Benchmark Technique Number 24 - Compaction of Waste* (EPA, 1996).
- Approvals/refusals from relevant authorities relating to fire prevention measures, such as controlled burning, will be retained and filed accordingly at the landfill site.

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## **Appendix H.      Pollution Management Plan**

~ Commercial-in-Confidence ~

# Pollution and Litter Management Plan

**Armidale Regional Landfill, Waterfall Way**

Report Number 23464.62596



*Prepared for*

*by*

**AECOM<sup>®</sup>**

Level 21, 420 George Street  
SYDNEY, NSW 2000  
Telephone: (02) 8295 3600  
Facsimile: (02) 9262 5060  
ABN: 20 093 846 925

***EnviroAg***  
*Australia*

PO Box 1775  
ARMIDALE NSW 2350  
Telephone: (02) 6772 9010  
Free call: 1800 445 389  
ABN: 56 135 005 999

# Document Status Record


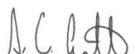


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This document provides information to address the intent of Project Number 23464 as agreed to by AECOM Pty Ltd.

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## **1. Introduction**

This document outlines the Pollution and Litter Management Plan for the proposed regional landfill facility situated on Waterfall Way, approximately 12 km east of Armidale. The plan has been prepared by EnviroAg Australia Pty Ltd for AECOM Pty Ltd on behalf of Armidale Dumaresq Council.

This plan details mitigation measures for the management of pollution and littering throughout the lifetime of the landfill, including the different stages such as construction, operation and post operation.

This Pollution and Litter Management Plan aims to encourage best practice environmental management in agreement with the principles of ecological sustainable development.

This plan is a requirement of the Project Approval Section 75J of the *Environmental Planning and Assessment Act 1979* (PAC NSW, 2012).

### **1.1 Objective**

The objective of this Pollution and Litter Management Plan is to prevent and minimise adverse environmental impacts of pollution and littering.

### **1.2 Document Review**

This Pollution and Litter Management Plan shall be reviewed annually and when circumstances change that may affect the content of this plan. The review will be conducted by the Waste Manager or their delegate and sections in need of amendment revised. Information to be considered when reviewing this plan should include complaints, incidents, monitoring data and the results of any external audit and inspection.



## **2. Identified Potential Impacts**

The environmental issues of primary concern to the community and the NSW Environment Protection Authority (EPA) in relation to landfilling operations are:

- Water pollution – discharge of pollutants to the groundwater and surface water;
- Air pollution – emissions of pollutants to the atmosphere;
- Land management and conservation; and
- Environmental hazards, nuisance and loss of amenity.

### ***2.1.1 Water Pollution***

Groundwater and surface water can be contaminated by untreated leachate from landfill sites. Leachate is the liquid that percolates through landfills as a result of infiltration and/or decomposition of the wastes. It may cause serious water pollution if it is not properly managed.

Surface water run-off from landfill site can cause unacceptable sediment loads in receiving waters, while uncontrolled surface water run-on can lead to excessive generation of leachate.

### ***2.1.2 Air Pollution***

Uncontrolled landfill gas emissions are not a sustainable landfill practice. Landfills primarily produce methane and carbon dioxide which, if not contained, can contribute to the ‘greenhouse effect’. Unmanaged gas emissions also represent a lost energy/fuel source. Landfill gas can also contain a variety of corrosive, toxic or odorous components.

### ***2.1.3 Land Management and Conservation***

All land is valuable, and the impact of its use as landfill needs to be sustainable. Proper care of landfill as a valuable asset should result in efficient remediation, enabling land to be used for other purposes following closure. Land management and conservation goals include diverting waste materials that can be re-used or recycled from landfills to minimise the loss of capacity, and managing the site to ensure that unsustainable wastes are not received and that the nature of wastes that are received is known.

### ***2.1.4 Environmental Hazards, Nuisance and Loss of Amenity***

The potential hazards and amenity impacts from landfills in regards to pollution include;

- Dust;
- Noise;
- Odour; and
- Litter.

Each of these potential impacts may occur on-site or off-site.

### 3. Roles and Responsibilities

The roles and responsibilities pertaining to this plan are detailed in Table 1.

**Table 1:** Roles and responsibilities

<b>Role</b>	<b>Responsibilities</b>
Waste Manager	<ul style="list-style-type: none"> <li>• Responsible and accountable for the overall environmental performance of the landfill site and the implementation of this plan;</li> <li>• Commit to and lead a positive environmental management culture and challenge 'at-risk behaviour';</li> <li>• Regularly communicate expectations and ensure workers and others understand and comply with this plan;</li> <li>• Undertake the annual review of this document;</li> <li>• Ensure adequate resources are provided to support the implementation, maintenance and continual improvement of this plan; and</li> <li>• Authorise and confirm the implementation of mitigation measures.</li> </ul>
Superintendent/ Environmental Officer	<ul style="list-style-type: none"> <li>• Responsible for the implementation of this plan;</li> <li>• Conduct monthly site inspections to monitor environmental performance and compliance with this plan;</li> <li>• Maintain internal records of monitoring;</li> <li>• Collate and maintain records of complaints and respond to complaints; and</li> <li>• Identify non-conformance and notify the Waste Manager.</li> </ul>
Landfill Operators	<ul style="list-style-type: none"> <li>• Equally responsible for the environmental management of the landfill site and compliance with the mitigation measures outlined in this plan;</li> <li>• Understand and actively participate in a positive environmental management culture;</li> <li>• Identify improvements or initiatives for environmental management; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>
Contractors and Others	<ul style="list-style-type: none"> <li>• Understand and adhere to the mitigation measures outlined in this plan; and</li> <li>• Immediately report incidents and unsafe conditions.</li> </ul>

#### 3.1 Training and Induction

Workers and others entering the site to undertake work activities shall be inducted prior to commencing work. The induction process shall ensure that workers and others are aware of their environmental obligations under this plan and required mitigation measures within the landfill site.

Retraining will be undertaken if there are any changes to procedures, or if any non-conformances to procedures are noted by a site inspection, a regulatory authority or public complaint. Ongoing training and communication shall also be provided to ensure that best practice environmental management is achieved at all times. Records of all inductions and training must be retained by Council for a minimum of five years.

## **4. Implementation Control Measures**

### **4.1 Surface Water Pollution (Stormwater)**

Surface storm water controls at the landfill are to be designed and constructed to prevent any surface water run-on from mixing with waste, and prevent any sediment or contaminants from being carried off the landfill site. Refer to the site *Water and Leachate Management Plan* (WLMP) for specific detail of control measures.

Following the commencement of operations at the landfill the WLMP will be reviewed on an annual basis.

### **4.2 Pollution Resulting from Groundwater Contamination**

Potential groundwater contamination may result from landfill leachate. Management of leachate will include:

- Construction of a leachate barrier system; and
- Construction of a leachate collection system.

Specific control measures and monitoring for leachate in groundwater is provided in the site WLMP.

### **4.3 Landfill Gas**

The design of the landfill has taken into consideration the requirement for landfill gas containment and monitoring as some of the gases produced by landfills are hazardous to humans and the environment.

Refer to the draft *Landfill Environmental Management Plan* (LEMP) (AECOM 2010b) for measures to minimise:

- Greenhouse gas emissions; and
- Energy use.

### **4.4 Noise**

All noise generated on site from construction and operation of the landfill must be compliant with the criteria and control measures set out in the site *Noise Management Plan* (NMP) which will be prepared prior to the commencement of any site based activities and transport operations.

### **4.5 Dust**

Dust will inadvertently be produced at the site during the construction and operational stages. Dust will primarily be generated from vehicles on unsealed areas. Control measures to minimise dust emissions are described in the site LEMP.

### **4.6 Odour**

Control measures for odours created by the landfill are described in the site LEMP.

### **4.7 Litter**

Litter control is generally an operational issue and best managed on a day to day basis, dependent upon location of tipping face, wind conditions and other factors.

Litter will be controlled on the landfill site in accordance with the *Landfill Guideline*

*Benchmark Technique 31-Litter Control* (EPA 1996), by using a combination of the following litter control system measures:

- The use of litter fencing;
- Ensuring that all windblown litter that leaves the site is retrieved;
- All vehicles are cleaned before they leave the site at the wheel wash facility;
- Signage will be installed at the landfill, which is clearly visible to vehicles exiting the facility. The sign will inform the vehicle operator that it is their responsibility to ensure that the remnants of their load or the material stuck to the underside of the vehicle or the wheels does not litter public roads;
- Regular inspection of all litter fences, perimeter fences and gates;
- Clearing of litter from fences and gate as required;
- Placement of signage specifying no illegal dumping. Signage of entry and exit gate to advise transport operators that they can be fined for any litter on public roads resulting from their improper transport of waste; and
- Promote community awareness of biodiversity value of Gara TSR, identified as key habitat by NPWS, by placing signage similar to “Significant Roadside Habitat” at the entrance to the landfill site.

The Waste Manager will be responsible for organising the daily inspection of the roads as well as their cleaning as required. The Waste Manager will be responsible for organising the weekly inspection of the wheel wash and organising any required maintenance/amendments to the wheel wash.

#### **4.8 Landfill Closure and Post-Closure Monitoring and Maintenance**

A Landfill Closure Plan will be developed before the completion of landfill operations and closure of the landfill. The Landfill Closure Plan will be developed and implemented in accordance with *Landfill Guideline Benchmark Technique Number 20 – Landfill Closure and Post Closure Monitoring and Maintenance* (EPA 1996). The purpose of the plan will be to ensure that the landfill continues to be non-polluting and not cause environmental harm after site closure.

The Landfill Closure Plan will include putting into place a post closure monitoring and maintenance program which ensures the long-term integrity of the landfill site. As with many other activities, post-closure monitoring and maintenance will control multiple environmental objectives, including emissions to water, emissions to the atmosphere, and protection of land use and local amenity. This monitoring and maintenance program must be provided until the landfill does not pose a threat to the environment.

## **5. Monitoring and Review**

The following section lists the various parameters to be monitored at the landfill site. Appendix O of the *Biodiversity Offset Management Plan* (document reference 22678.38513) provides a checklist for pollution and litter management.

### **5.1 Surface Water**

To enable the detection of surface water pollution, the surface water monitoring program will monitor and report the characteristics of the surface water as well as identify the surface water flow pathways on-site.

Baseline surface water monitoring has been conducted and is presented in the *Water Quality Monitoring Program and Management Plan* (AECOM 2010b).

Ongoing surface water monitoring of the proposed landfill facility will enable the effects of any water contamination to be assessed. Surface water monitoring will be undertaken quarterly, as detailed in WLMP and the results will be included in annual report which will be submitted to the OEH.

### **5.2 Groundwater**

Groundwater quality will be monitored in accordance with the WLMP and LEMP. Groundwater monitoring results will be reported in the annual report which will be submitted to the OEH.

### **5.3 Landfill Gas**

Landfill gas monitoring will be undertaken in accordance with the site LEMP. Monitoring results will be reported in the annual report which will be submitted to the OEH.

### **5.4 Cleaning of Vehicles**

The Waste Manager will be responsible for organising the daily inspection of the roads as well as their cleaning as required. The Waste Manager will be responsible for organising the weekly inspection of the wheel wash and organising any required maintenance/amendments to the wheel wash.

If vehicle cleaning is not controlled adequately at the site, the vehicle cleaning system in place will be reviewed and amendments made as required.

The condition of the wheel wash will be documented by the Waste Manager or Environmental Officer on a monthly basis and all amendments/maintenance made to the system also recorded, including explanatory notes.

### **5.5 Noise**

The number of noise complaints will indicate if the noise controls implemented are performing in accordance with the noise control objectives.

The environmental officer will maintain records of all noise complaints within the site PIRMP. The officer will correlate the details of complaints received with weather conditions and the activities undertaken on-site during the time period when the noise complaint occurred.

The results of the noise monitoring records will be reported in the annual report. This report will be submitted to the OEH.

The environmental officer will make available a report on complaints received to the community, Council and relevant government agencies upon request. A summary will be included in the annual report.

It is expected that the noise controls will be refined during detailed design, construction and operation of the landfill and will be included in the site NMP. Consequently, the controls implemented may vary from those provided herein.

## **5.6 Dust**

Dust monitoring will be undertaken in accordance with the site LEMP. Results of the monitoring will be included in the annual report submitted to OEH.

The environmental officer will record details of all complaints received in the site PIRMP and will ensure that a response is provided to the complainant within 24 hours. The corrective action may involve supplementary monitoring to identify the source of the non-conformance, and/or may involve modification of construction or operational techniques to avoid any recurrence or minimise its adverse effects.

The environmental officer will make available a report on complaints received to the community, Council and relevant government agencies upon request. A summary will be included in the annual report.

## **5.7 Odour**

The instances of odour complaints will indicate if the controls implemented are performing in accordance with the odour control objectives.

The site environmental officer will maintain records of all odour complaints. The officer will correlate the details of complaints received with weather conditions and deliveries of particularly odorous wastes.

The results of the odour records will be reported in the annual report. This report will be submitted to the OEH.

The site environmental officer will make available a report on complaints received to the community, Council and relevant government agencies upon request. A summary will be included in the annual report.

It is expected that the odour controls will be refined during detailed design, construction and operation of the landfill. Consequently, the controls implemented may vary from those provided herein.

## **5.8 Litter**

The Waste Manager will be responsible for organising the regular inspection of the gates, litter and perimeter fences as well as their cleaning as required.

Where complaints are received, the site environmental officer will record the following information:

- Details of any complaints regarding litter, including the complainant's name, address and contact number;
- A summary of the litter complaint: complainant location, time of day, notes regarding the event;
- Details of the response to complaints (including corrective action, etc.); and

- A log of all factors related to the event, i.e. time of the complaint, frequency of the event if occurring on multiple occasions, landfilling operation details, weather conditions etc.

The environmental officer will record details of all complaints received and this information will be kept in an up-to-date log-book (the Pollution Incident Response Management Plan (PIRMP)) and ensure that a response is provided to the complainant within 24 hours. The corrective action may involve supplementary visual inspections to identify the source of the non-conformance, and/or may involve modification of construction or operational techniques to avoid any recurrence or minimise its adverse effects.

The site environmental officer will make available a report on complaints received to the community, Council and relevant government agencies upon request. A summary will be included in the annual report.

If litter is not controlled adequately at the site, the litter control system in place will be reviewed and amendments made as required.

The condition of the litter control devices will be documented by the environmental officer on a monthly basis and all amendments/maintenance made to the system also recorded, including explanatory notes.

## **5.9 Leachate**

The objectives of the leachate monitoring program are to enable the leachate produced by the landfill to be characterised so that the status of the landfill can be determined (i.e. active landfill) and the storage/use options of the leachate can be assessed. The leachate monitoring program is described in the site WLMP.

All leachate monitoring results will be documented and reported in the annual report and submitted to the OEH.

## **5.10 Landfill Closure and Post-Closure Monitoring and Maintenance**

Post closure monitoring will determine if the landfill closure plan implemented has succeeded in achieving the landfill closure objectives (i.e. that the landfill continues to be non-polluting and does not cause environmental harm after site closure).

The Waste Manager will oversee the closure of the landfill to ensure that the landfill closure plan is adhered to. The maintenance and monitoring of the closed landfill will be undertaken in accordance with the landfill closure plan.

The site environmental officer will record the results of post closure monitoring undertaken and provide the results to Council and relevant government agencies upon request.

It is expected that the landfill closure plan will be refined during the life of the landfill.

## 6. References

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Tchobanoglous, G., Theisen, H., Vigil, S.A. (1993). *Integrated Solid Waste Management*. McGraw-Hill, New York.



## **Appendix I.      Department of Planning and Infrastructure Offset Recommendations**

Your Reference : 20017605: C058  
Our Reference : DOC06/xxxx  
cc : Armidale Dumaresq Council  
Contact : Todd Soderquist, 6773 7006  
Date : 8 December 2006

Mr Chris Wilson  
Major Development Assessment  
Department of Planning  
GPO Box 39  
SYDNEY NSW 2001

Attn: Mr Brad Deane

Dear Mr Wilson

## **OFFSET PROPOSAL – ARMIDALE REGIONAL LANDFILL**

As you are aware, the Regional Landfill proposed by the Armidale Dumaresq Council will have detrimental impacts upon threatened species and communities. The Council has requested that the Department of Environment and Conservation (DEC) provide guidelines on how to offset these impacts. Mr Deane has previously advised the Council's consultants that they may work directly with the DEC in developing offset guidelines specific to the landfill. This letter outlines the results of these early discussions and is being provided to both the DOP and Council.

On 8 November 2006, Dr Todd Soderquist DEC Senior Threatened Species Officer, conducted a site inspection of the proposed landfill site with Mr Col MacIver from the Council and EA Systems consultants Mr Martin Dillon and Dr Liz Broese. Dr Soderquist assessed habitat quality and management requirements in the vicinity of proposed landfill, including surrounding areas that have been suggested by the Council as potential offset areas. On the basis of this inspection and information provided by EA Systems, the DEC provides the following advice on actions to maximise the environmental outcomes of offsets to the proposal. The DEC may support the Council's landfill proposal if it is satisfied with the offset proposal.

In order to assess the merits of proposed offsets against general principles outlined in Attachment A, the DEC requires information on both the anticipated impact and the offset. Attachment B sets out a range of criteria that the DEC considers to be the minimum necessary to evaluate the offset, and in this case, define the biodiversity values of impacted areas and candidate offset area(s). Particular attention is needed to the potential application of management actions in Section 7. Some of the criteria relate specifically to the landfill site (e.g. transfer of logs) while others are generic and relevant to the design of any offsetting initiative. For each criterion in the table, we have described the DEC's preferred outcome and attached notes on the information needed.

### **A. Specific Issues for the Council**

#### **1) On-site actions: Avoid, Minimise, Rehabilitate**

The development proposal should address the need to avoid impacts if possible, minimise those that will occur and rehabilitate each cell of the landfill as it is completed. For example, the *Soil Conservation Act* requires the proponent to rehabilitate the landfill site to stabilise and recreate a landscape that is compatible with the surrounding land and comparable to pre-existing land use.

The objective is to minimise future maintenance requirements by, among other actions, minimising soil erosion and consequent sedimentation of the surface drainage system. The science guiding rehabilitation/stabilisation of mine sites is considerable and should generally apply to landfill site rehabilitation. Evidence from current best practice management demonstrates that it is economically feasible and practical to stabilise soils and the landscape.

## **2) Offsite: Offsetting Impacts to Biodiversity**

There has been increasing pressure to restore landscapes to minimise long term social cost and clearly establish measurable rehabilitation objectives that demonstrate sustainability. However, it would be erroneous to equate rehabilitation and stabilisation of a landfill site with the re-instatement of pre-disturbance biological diversity and natural ecological processes. Creating geomorphologically stable landscapes during rehabilitation does not ensure re-establishment of the complexity and diversity of natural ecosystems, especially where the loss of older trees will require centuries to replace. Restorative practices are only now developing, the cost is significant and the long-term success is uncertain.

Consistent with the *EP&A Act*, *TSC Act* and *NP&W Act*, the proponent of any development is obliged to avoid natural and cultural features to the greatest extent possible. No definitive experience or historical evidence exists to assure us that pre-disturbance 'naturalness' and biodiversity levels can be re-established following landfill construction. Nor is there any empirical information enabling us to gauge the rate at which biodiversity might recover.

Nevertheless, it is clear from the nature of landfilling that impacts to biodiversity are intense and that they will span time scales that are at least inter-generational, if not permanent. Furthermore, the losses that will occur at the landfill site also contribute to the already significant level of cumulative loss that has occurred at a regional scale on the New England Tablelands.

The only meaningful way to counter the direct impacts to biodiversity on the landfill site and to avoid adding to the cumulative loss at regional scale is to take actions to remove threats to or 'enhance' biodiversity at another site. Offsetting is a means by which we can narrow the biological shortfall between a rehabilitated (stabilised) landscape and a pre-disturbance landscape. Put another way, the biological debt incurred on-site can be remedied by a closely comparable credit (or better) off-site.

## **3) Defining an Appropriate Offset**

Damage to biodiversity from the landfill will be immediate yet most management actions are expected to compensate for biodiversity loss only with gradual improvements. The New England Tablelands is a highly modified province and the DEC is concerned to ensure that, as far as possible, future developments take action to address cumulative impacts over both space and time. The information requested in the attached table should provide DEC with sufficient information to enable it to evaluate the merits of candidate offset areas.

The criteria in Attachment B vary in nature considerably. The DEC fully recognises that the values pertaining to one criterion are not directly or empirically 'comparable' with those of another criterion. Further, the DEC understands that it may not be possible, feasible or practical for the proponent to satisfy the DEC's preferences in terms of all criteria within one land parcel. In order to address one criterion well, compromises may need to be made to one or more others.

The DEC will evaluate the overall merit of an offset proposal having considered all criteria collectively. Importantly, the approach adopts a systematic assessment process and confers transparency for defensible decision-making.

As a guide to the size of offsets required, the Biometric Tool used in Property Vegetation Planning within NSW applies ratios for many threatened species on the order of 20:1 for offset to impact area. Logically there would be little reason to vary these ratios across proposals. In this instance there is potential for intensive management of offsets that might greatly improve the biodiversity contribution of these areas. From that perspective, if suitable management effort is incorporated in the proposal, an offset ratio of 3:1 or greater may be appropriate for the landfill.

#### **4) Information Required from Armidale Dumaresq Council**

High levels of detail are not necessary when addressing topics in Attachment B. Photographs with expert field observations will be sufficient for the DEC to form a view. For example, full species lists are not required. In completing the table DEC requests:

- a) The Council to address each of the criteria with information for both the landfill area and the proposed offset area(s).
- b) The Council simply describes impacted and offset areas under consideration, not evaluate the merit of the offset proposal to biodiversity in great detail.

If you wish to discuss any matter raised in this letter please ring Todd Soderquist in the Armidale office on 6773 7006.

Yours sincerely

Simon Smith  
Manager Armidale Region  
Environment Protection and Regulation Division  
**Department of Environment and Conservation**

## Attachment A

# Offset Principles for Biodiversity Conservation Offsets under the Environmental Planning and Assessment Act, 1979

## 1. Introduction

The Department of Environment and Conservation is the agency legally responsible for biodiversity conservation across the state. There continues to be pressure on natural values from urban, industrial and agricultural development. As a consequence of past land-use decisions, a pressing short-term challenge is to secure and manage the larger, more intact landscape remnants so that fragmentation does not increase and natural values are not further diminished. In the longer term, the challenge for biodiversity is to rebuild landscapes that are ecologically viable for native species at all scales. Without mechanisms such as policy frameworks, this loss is likely to continue at a greater rate and in a less managed fashion.

The Environmental Planning and Assessment Act (EP&A Act) 1979 is the principal instrument in NSW governing land use planning and development control. Its objects include a commitment to ecologically sustainable development and to the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats. More broadly, the NSW Government has made a commitment to prevent further broad scale clearing of native vegetation, recognising that too much has been cleared in parts of the State with very serious environmental consequences.

Continued development and the inevitable expansion of urban and coastal settlement, in particular, will involve unavoidable loss of natural and semi-natural areas through land use change into the future. Developers have for some years offered to protect or transfer unaffected lands to other agencies or councils to compensate for environmental impacts.

The use of formal “offsets” schemes has emerged as a potentially feasible option when dealing with a wide range of development impacts. The NSW Government has already released discussion papers on “*Green Offsets for Sustainable Development*”<sup>1</sup>, “*Offsets, Salinity and Native Vegetation*”<sup>2</sup> and “*Compensatory Wetlands*.”<sup>3</sup>

In all of these publications, offsets are employed as a last resort after other methods to avoid, minimise and mitigate impacts have been considered. It is only one tool that can be employed, in limited circumstances, as part of a mix of strategies to achieve conservation outcomes and manage loss.

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<sup>1</sup> NSW Government April 2002, Green Offsets for sustainable development: Concept paper NSW Environment Protection Authority, NSW Department of Land and Water Conservation, NSW National Parks and Wildlife Service, Planning NSW

<sup>2</sup> NSW Department of Land and Water Conservation (2001), Offsets, Salinity and Native Vegetation: Discussion Paper, NSW Department of Land and Water Conservation, Sydney  
[<http://www.dlwc.nsw.gov.au/care/salinity/pdf/offsets.pdf>]

<sup>3</sup> NSW Department of Land and Water Conservation and NSW State Wetlands Advisory Committee (Nov 2002), Compensatory Wetlands: A discussion paper under the NSW Wetlands Management Policy, NSW Department of Land and Water Conservation, Sydney  
[<http://www.dlwc.nsw.gov.au/care/wetlands/cw/cw.pdf>]

## 2. What is an offset?

The term offsets refers to agreed actions that are undertaken to counter-balance the adverse impacts of approved development. In relation to biodiversity, offset actions provide a mechanism to compensate for loss of biodiversity values in one area by action elsewhere.

Benefits for biodiversity management may be achieved in three ways:

1. Securing protection of other, existing areas of equivalent conservation value. Habitat loss is one of the key threats to biodiversity. The permanent securing of areas of biodiversity value is an important gain, particularly if the area is also under threat.
2. The enhancement of existing habitat. This may include better management of existing habitat, assisted regeneration of degraded habitat, fencing and pest and weed control. This approach can increase the viability of existing remnants and needs to be considered in a regional context.
3. The protection of cleared land and the restoration or reconstruction of habitat. This involves high risks and uncertainties for biodiversity outcomes. This approach might be used strategically to link areas of high conservation value or to increase buffer zones around areas of high conservation value.

In most regions, preference is likely to be given to the first approach. That is, as a general rule the priority for offsets should be given to the protection, and enhancement if necessary, of threatened areas of equivalent biodiversity value to the impact area.

The enhancement of habitat in poor condition and habitat reconstruction would typically be undertaken where this would buffer high value habitat, or provide connectivity. Priority for these kinds of offsets may be higher if they are part of a landscape/regional habitat strategy. Where the only available habitat for some threatened species or endangered ecological communities is degraded, restoration and protection can also become a high priority.

## 3. Objectives of biodiversity offsets

1. To encourage well designed development proposals that take full account of all potential impacts.
2. To minimise loss through consideration of options to avoid or minimise biodiversity loss or mitigate biodiversity damage, and only use offsets to compensate for unavoidable biodiversity impacts as a last resort.
3. To use offsets to secure, protect and manage areas of significant biodiversity value into the future.
4. To take account of the potential contribution of different management and restoration actions in developing an offset proposal.
5. To calculate the area required for an acceptable offset according to the relative conservation values and condition of the impact area and offset area(s) (i.e. the ratio will vary depending on the relative values).

## 4. Principles of biodiversity offsetting

1. Offsets are only used to address residual impacts following consideration and implementation of options to avoid, minimise and mitigate impacts.

2. Offsets should be based on an agreed understanding of the conservation significance of the impact and offset values.
3. Offsets should maintain or improve identified biodiversity values secured into the future.
4. Offsets should be based on a “like for like” basis.
5. Offset area should be greater than the area impacted.
6. Offsets should generally be in proximity to the area impacted.
7. Offset actions should be located in areas of strategic regional conservation value where Principle 6 does not apply.
8. Offsets should be in addition to existing initiatives.
9. Offsets should minimise ecological risks from time lags.
10. Offsets should be secure, long term and auditable.

In applying these principles to an offset package, not all principles will be of equal relevance in all circumstances. The priority for each principle will depend on the regional conservation and development context, the nature of the identified biodiversity impacts of the development, the availability of offset options, the long-term management options for offset land and the relative likelihood of success of any option in the circumstances. For example, there may be circumstances where the “like for like” and “proximity” principles are given a lower priority in order to achieve strategic, targeted, viable and secure offset actions at a regional or vegetation community level.

Any trade-off between these principles should be considered in the context of the cumulative effects and any targets for biodiversity in a strategic regional context. The long term impact development and the use of offsets on other than a “like for like” basis should not result in the depletion of particular species or communities to the point where their persistence is put at risk.

The agreed offset package for any development proposal should explain the priority given to each offset principle in a clear and transparent fashion.

**Principle 1: Offsets are only used address residual impacts following consideration and implementation of options to avoid, minimise and mitigate impacts.**

Offsetting should only be utilised as a last resort after all other options to avoid, minimise and mitigate impacts have been considered and deployed. Offsets address the residual impact following this process.

This process can be expressed succinctly as follows:

- Avoid impacts and retain biodiversity with priority for retention of habitat, which is of identified high conservation value and in good condition. This can be achieved through sensitive design and development planning.
- Minimise impacts where unavoidable. One way to minimise impacts is to reduce the size of the area to be impacted.
- Mitigate impacts to reduce the short, medium and long-term effects. The impacts on biodiversity need to be managed by implementing design, operational or organisational safeguards or controls such as exotic species management, erosion and sediment control, design innovation and rehabilitation of disturbed areas.

Where it can be demonstrated that no suitable development alternative exists, all prudent and feasible options have been examined and the development is deemed to be of sufficient community benefit to proceed, an agreed biodiversity offset package can be provided. This offset package should be developed and implemented to address the residual impacts that are agreed to be justified and unavoidable.

**Principle 2: Offsets should be based on an agreed understanding of the conservation significance of the impact and offset values.**

Consideration of offsets should only proceed following a comparison of the biodiversity significance of the impact and offset areas, based on the best available information and ecological principles.

It is important that there is an agreed understanding of the minimum level of data required and the methods to obtain this data. The level of risk and the dynamics of the natural system also need to be identified in developing offset options. It is essential that uncertainties arising from sparse ecological data and incomplete knowledge of species responses over time are taken into account in ranking or assessing options. It is also important that the potential risks to an offset option, for example from offsite threatening processes and climate change, are considered.

**Principle 3: Offsets should maintain or improve identified biodiversity values secured into the future.**

Offsets seek to compensate for the loss of biodiversity due to a development impact by maintaining or improving biodiversity values away from the impact area. The balance between loss and gain may be calculated according to the conservation significance of the impact and offset areas and the likelihood of the persistence of the values to be protected as an offset. Offset options will vary according to the biodiversity values of what is lost and the values, future viability and security of the offset option.

To achieve this outcome it is essential that the nature of the loss is clearly defined, the predicted secured benefits from offsetting are clearly identified and the means by which they will be delivered is legally agreed as part of the consent process prior to any works commencing.

**Principle 4: Offset should be based on a “like for like” basis**

1. Biodiversity losses must be offset with biodiversity gains. Biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity requirement. Benefits cannot be traded across types. For example, salinity benefits cannot offset biodiversity losses.
2. Preference in selecting offsets must be given to protecting areas that are of the same vegetation and habitat type and conservation significance as those being impacted within the regional context. This principle recognises that offsets should contribute to the long-term retention and recovery of habitat types and species depleted through development. The risk otherwise is that some habitat types will be substantially cleared, and therefore put at risk of at least regional extinction, in exchange for the protection or revegetation of other types.
3. Where there is no available “like for like” offset of reasonable size or viability, consideration should be given to protecting communities that are under a similar level of threat in strategic targeted areas (see principle 7), or to restoration of degraded areas of similar habitat type or reconstruction of habitat. These mechanisms can increase the viability of existing remnants, provide connectivity between areas of high conservation value or increase buffer zones around areas of high conservation value.

However, offsets should not be used when “like for like” is not possible **because** the development places the continued persistence of a species or community at significant risk of extinction by removing one of the last refuge areas for the species or community. Other mechanisms should



then be invoked to avert the risk, for example, conditioning consent to require ex-situ conservation actions as a mitigation of impact.

**Principle 5: The offset area should be greater than the impact.**

The destruction of habitat or removal of native vegetation must be counter-balanced by offset areas greater than the area impacted. The greater area counters, to some extent, the risks and uncertainties associated with offsetting. The exact offset ratio to be applied will depend on the circumstances of the case. Knowledge of the total surviving extent of the habitat or vegetation type(s) involved, its historical depletion and the area that will be removed by the development are crucial considerations in relation to the viability of the offset.

Where an offset is proposed that is of poorer habitat condition than the vegetation cleared, a higher offset area ratio is justified, on the basis that good condition, essential to future sustainability, is difficult to recover. The highest ratios should apply for the revegetation of cleared land to account for the considerable timeframes and risks associated with revegetation. More than one offset location may be required to compensate for several impacted species or to compensate adequately for a single species.

**Principle 6: Offsets should generally be in proximity to the area impacted**

To ensure equity in the sharing of the impacts of development and the benefits of offsets, it is preferable that offset measures be provided in reasonable proximity to the areas impacted. There are a number of reasons for this:

- Applying the offset locally minimises the risk that any one area receives an unreasonable burden of impacts without receiving any benefits that offsetting can provide;
- Retaining habitat across its natural range spreads the risk of loss from catastrophic events such as fire;
- Protecting local populations may contribute to the conservation of genetic diversity.

Suitable boundaries for offsetting will vary. In rural areas, suitable areas may be subregions within bioregions. In urban areas, local government areas may be more appropriate. For very specific values such as particular threatened species, the offset boundary may be the natural distribution of the species involved.

Practical considerations such as the availability of suitable offset areas, viability and security may also affect the offset package. In some cases, a better conservation outcome that satisfies the other offsetting principles may be achieved by considering offset options over a greater distance from the impact. Strategic outcomes may take priority over proximity in these circumstances.

**Principle 7: Offset actions should be in areas of strategic regional conservation value where like for like is not available in proximity to the impact**

Where “like for like” cannot be achieved in proximity to the impact, biodiversity offsets may be targeted to achieving protection of those areas of significant vegetation that are at most risk or less secure in the locality, or those areas that have most strategic conservation value in an intensively modified region. For example, in highly developed regions, there may be very few large areas of any natural vegetation type remaining. The priority for offsetting actions could be directed to enhancing the status of remaining viable species or communities or protecting any large viable patches of habitat that are rare and at risk of loss and fragmentation.

**Principle 8: Offsets should be in addition to existing initiatives**

Offsets should not utilise areas where public funds are already being applied for conservation and management eg. Landcare restoration projects and revegetation of council reserves. Offsets can be used to expand and complement these existing conservation programs provided there is well documented and transparent accounting to ensure there is no double accounting.

Offsetting is generally not appropriate on public land, as there are existing statutory responsibilities for public authorities to manage heritage values. Offsetting should not generally be used to supplement the budgets of public land management authorities.

### **Principle 9: Offsets should minimise ecological risks from timelags**

Any time lags between removing and replacing habitat function should be factored into the specification of offsets (for example where mature paddock trees are replaced by new plantings). These may range from initiating offsets well prior to impact to initiating offsets as soon as practicable, but with the risks involved to biodiversity factored into the location, replanting ratio and total area of the offset proposal.

### **Principle 10: Offsets should be secure, long term and auditable**

Offset strategies must be demonstrated to be secure and their conservation values should be evident within an acceptable timeframe. The legal and administrative arrangement that bind an offset must be clear and binding in perpetuity with penalties for non-compliance (see point 5 for suggested mechanisms).

Mandatory documentation (a Register) of offset agreements should convey full details about all locations and actions involved in an agreement. A spatial record on a centralised GIS spatial database, managed by DEC and accessible by DEC officers, is also required. These records ensure that details of offset agreements are not lost over time and future development proposals do not reverse any gains. They are also a vital tool for monitoring compliance with the agreed terms of an agreement and the success of conservation outcomes.

Requirements for ongoing monitoring and evaluation, as well as technical specifications for the work, should be factored into the offset agreement. It may be appropriate that the developer funds the first 5-10 years of monitoring to ensure that the intent of the agreement is being met. After a period, the responsibility could rest with local or state government and for the landholder.

## **5. Mechanisms to achieve security**

A major obstacle to securing conservation outcomes is uncertainty regarding future ownership and management of lands agreed to be set aside from development ie. the offset site.

The preferred mechanisms to achieve security are:

- *Acquisition of land* with transfer to a public authority for ongoing management eg. Council, NPWS or Trust. This provides the most secure option for offsets but may be limited given the ongoing resourcing implications unless financial contributions are also negotiated.

In the case of DEC, there are only certain types of lands that would qualify for reservation under the provisions of the NPW Act 1974. In general, preference is given to lands that meet state-wide conservation priorities; contain high conservation value vegetation; have threatened species habitat values; demonstrate corridor opportunities; have suitable size and boundary configuration; have regional recreation or open space values and are supported by adequate management funding (whether from private or public sources).

Council management would also require some ongoing commitment for establishment and operational costs to ensure that the costs of offsetting the impacts of a development are not simply transferred from the proponent to the community.

- *Conservation covenants on private land.* Conservation agreements exist under the *National Parks and Wildlife Act, 1974*, the *Nature Conservation Trust Act, 2001*, as well as appropriately worded s88B covenants under the *Conveyancing Act 1919* where the benefiting authority is either the council or the DEC.

A covenant restricts or prohibits activities that could degrade the environmental value of the land; is permanent and registered on the title to the land and is approved in writing by, or is entered into under a program approved in writing by a government authority. Conservation covenants may be eligible for concessional tax treatment and for other financial assistance (eg. Rate exemptions).

Less secure mechanisms need to be employed with caveats to ensure protection in perpetuity. They will generally be less attractive as offset options where more secure commitments are possible.

- *Wildlife Refuges, under the National Parks and Wildlife Act 1974*, can also be registered on the title deeds of the land for information purposes, but can be rescinded by the landowner or occupier at any time and are not secure.
- *Conservation zoning and development controls.* This refers to land use zoning in the Local Environment Plan (LEP) that identifies biodiversity protection and management as the primary objective and use of that land. The disadvantage of this mechanism is that the zoning can be changed at some later date without reference to original offset agreement. This mechanism should include a caveat in the LEP that requires referencing to the Minister responsible for conservation if there is a proposed change in the zoning of offset land.
- *Stewardship payments for development controls.* This basically provides incentives for a period of time to landowners to manage the conservation values of their land. However, security in perpetuity is not assured. If accompanied by a covenant or long-term (i.e. 30 year) contractual commitment, these may still be attractive offset options.

## Attachment B

Offset Criterion	DEC Preferred Outcome	Proposed Outcome (Proponent to complete these columns)	
		Landfill Site	Offset Site(s)
1. Area of Offset	Ratio of offset to impact greater than 3:1 to account for time-lags and uncertainty, i.e., instantaneous adverse impact on-site, v. long term, gradual improvement to condition/ biodiversity level in offset area. The offset must consider that the larger trees being cut down are irreplaceable within a century.	The landfill operational area will occupy 19.7 ha. This includes 12.7 ha of regrowth stringybark woodland and 6.5 ha of cleared grassland which will be progressively cleared over the lifespan of the facility.	A 3:1 offset to impact ratio will result in an area of 38 ha of stringybark woodland and 20 ha of cleared grasslands used as an offset.
2. Ecosystem Type	Ecosystems that are least represented in the current reserve network and subject to greatest threat of modification.  Preferred ecosystems (including above) that occur in lower topographic positions and/or on more productive soils (volcanic soils, mid-lower slopes and alluvial flats).	The landfill pit will be placed in stringybark woodland with associated infrastructure (road, leachate ponds) in adjoining grasslands. Condition of both communities is low.	Regrowth stringybark woodland and grassland adjacent to the site, currently in a similar condition as the landfill site, will be used for an offset. Fencing, weed and pest control, and relocation of timber piles will improve the condition of the offset.
3. Landscape Context	Although it is typically preferable that the offset area be connected with other sizeable remnants of native vegetation, in this instance the DEC recognises the efficiency of purchasing and managing offsets that are contiguous with the landfill. Nonetheless, the concept of landscape connectivity should be applied as much as is feasible on a local basis. The DEC would expect woodland areas to the south and east of the landfill to be core portions of any offset design. Any proposal to connect these woodlands with the others would help the offset quality.	Little continuity currently exists between the patch of stringybark woodland and adjoining woodlands.	Fencing and regeneration of woodland in the proposed offset area to the east of the site would decrease the distance between woodland remnants by several hundred metres.

Offset Criterion	DEC Preferred Outcome	Proposed Outcome (Proponent to complete these columns)	
		<i>Landfill Site</i>	<i>Offset Site(s)</i>
4. Offset Consolidation and Potential for Future Growth	A single, sizeable offset is preferable to isolated and smaller offset areas, with potential for expansion into neighbouring lands (remnant vegetation) through voluntary creation of corridors under incentive programs. Benefits: 1. Ecological viability increases with size; 2. Management efficiency maximised and costs reduced; 3. Planning for future landfill expansion expedited and “certainty” increased.	The landfill site will be located in the centre of the existing woodland. Offset areas will surround the landfill in a connected remnant.	The offset will be one continuous remnant of 60 ha surrounding the proposed landfill pit and infrastructure.
5. Condition	Native vegetation with minor/nil disturbance, stable and productive soil surface condition and minor/nil weed invasion. Areas containing largely cropped lands are not considered to contribute highly as conservation offset.	All of the current landfill footprint area is highly disturbed with high numbers of fauna pests and weed invasion. Both the grassland and the woodland are currently used as grazing the land.	The proposed offset areas are similar to the existing landfill site and have been extensively grazed. Mitigation measures, including eradication of pests and weeds, and erecting fencing to exclude grazing will improve the condition of the offset area.

Offset Criterion	DEC Preferred Outcome	Proposed Outcome (Proponent to complete these columns)	
		Landfill Site	Offset Site(s)
7. Proposed Management	<p>Commitment to removing/ minimising threats to biodiversity. Management actions include:</p> <ol style="list-style-type: none"> <li>1. Clearing of trees on the landfill area is to progress only as the landfill is expanded on a cell by cell basis.</li> <li>2. Domestic livestock are to be removed immediately after land purchase.</li> <li>3. The offset areas are to be fenced with livestock proof and rabbit resistant fencing.</li> <li>4. Exotic herbivores (goats, rabbits, pigs) are to be eliminated or controlled in the offset areas. Densities of rabbits are to be monitored closely and any irruption must be controlled immediately. Guidelines for control need to be developed.</li> <li>5. Cat populations associated with the landfill are to be kept under constant control.</li> <li>6. Control of foxes in the offset area is desirable, especially if part of a broader regional program with neighbouring properties. Localised control of foxes reliant upon the landfill is required.</li> <li>7. Weeds are to be controlled at all times.</li> <li>8. Hazard reduction burning in offset areas is not permitted. If hazard reduction burning is required as a buffer to the landfill, the design must minimize the area burned or preferably use slashing to achieve a narrow buffer.</li> <li>9. Move hollow trees from landfill area to offset areas as logs or erect as stags if feasible.</li> <li>10. Move all logs that are &gt;20 cm diameter at any point off the landfill site to the offset area.</li> <li>11. Rehabilitation of tree cover in selected areas should begin as soon as possible after stock removal. Monitoring of understorey response</li> </ol>	<ol style="list-style-type: none"> <li>1. Clearing of trees on the landfill area is to progress only as the landfill is expanded on a cell by cell basis.</li> <li>2. The site is currently overrun with hundreds of rabbits and some foxes.</li> <li>3. Exotic blackberry and hawthorn shrubs will be eradicated prior to construction in both the landfill and offset site.</li> <li>4. Ongoing targeted monitoring and weed control of exotic grasses (Coolatai grass, African lovegrass, serrated tussock, Chilean needlegrass) will be implemented in areas subject to soil disturbance.</li> <li>5.</li> </ol>	<ol style="list-style-type: none"> <li>1. Domestic livestock are still grazing on the site, but will be removed prior to commencing construction.</li> <li>2. The offset area will be fenced to exclude livestock. Construction of fencing to exclude rabbits and introduced predators will be erected around areas to be regenerate or revegetated until they are established.</li> <li>3. A control plan for rabbits, foxes and cats will be implemented.</li> <li>6. Exotic blackberry and hawthorn shrubs will be eradicated prior to construction in both the landfill and offset site.</li> <li>4. Ongoing targeted monitoring and weed control of exotic grasses (Coolatai grass, African lovegrass, serrated tussock, Chilean needlegrass) will be implemented.</li> <li>5. Hazard control burning should not be required for the landfill.</li> <li>6. Hollow logs and erect stags will be relocated from the landfill footprint to the offset area. These logs may be of highest value on the grassland community where dead wood is more scarce.</li> <li>14. Rehabilitation of tree cover in selected areas will begin as soon as possible after stock</li> </ol>

Offset Criterion	DEC Preferred Outcome	Proposed Outcome (Proponent to complete these columns)	
	<p>to grazing removal should be initiated concurrently.</p> <p>12. If understorey response is minimal, apply assisted rehabilitation (selected replanting of shrubs and seeding if feasible) especially in treeless areas.</p> <p>13. Low intensity thinning of dense stands of young trees can be applied in a small-scale mosaic pattern if carefully designed to have ecological benefit. Growth and stand structure response needs to be monitored. Draft protocols for such thinning are provided in Appendix C. Thinning is not a required action, but should be applied if judged to be beneficial.</p>		<p>removal. Monitoring of understorey response to grazing removal will be initiated concurrently.</p> <p>7. If understorey response is minimal after 12 months of stock removal planting of shrubs and seeding will be implemented.</p> <p>8. Dense regrowth in the far southern portion of the offset area may benefit from thinning. Thinning will be implemented as per Appendix C.</p>
8. Permanency / Security of Offset	<p>A. Secure dedication to conservation land use and management into perpetuity. Mechanisms include (but not limited to):</p> <ul style="list-style-type: none"> <li>• Ownership vested in Council, Land Trust or Bio-bank;</li> <li>• Formal Conservation Agreement (VCA under NPW Act) bound to title prior to on-selling;</li> <li>• Covenant on title.</li> </ul> <p>DEC prefers strongest form of dedication and highest level of protection from future disturbance over inter-generational timeframes.</p> <p>B. Area chosen is of nil or minimal potential for mineral prospecting.</p>		The ownership of the proposed landfill site is vested in the Armidale Dumaresq Council.

### Notes on Attachment B – Information required.

#### a) Criteria 3, 4 and 5.

Scanned aerial-photos showing both the impact areas and proposed offset area(s) would be preferable. These will facilitate assessment of the areas within the context of the broader landscape in terms of:

- surrounding vegetation remnants;
- connectivity to remnants;
- topographic position;
- configuration with respect to DEC estate; and
- potential for future growth of the offset area.

## **b) Criterion 2 (Ecosystem Type)**

Describe vegetation, soils and topographic position. This does not need to deal with likely/known fauna or fauna habitat.

*Photographs* - of each area (impacted and offset area(s) showing topographic context and typical vegetation in each area. This would assist and complement written descriptions below.

### *Vegetation description*

- Structure;
- Dominant floristics – 1-3 dominant plants of each vegetation stratum;
- Patterning – homogeneous through to highly variable. If patterning significant, describe various vegetation patches in area in terms of structures/floristics;
- Unique/rare or otherwise “special” vegetation features;
- Endangered Ecological Community.

### *Soils*

- Parent geology
- Observed (not measured) soil colour and texture;
- Variability over area. If highly variable, describe range in colour and texture

### *Topography*

- Topographic position
- Terrain element
- Slope – estimated
- Aspect

## **c) Criterion 6 (Condition)**

### *Vegetation*



- Disturbance - nature and extent (% of area) of in terms of clearing, grazing and/or cropping;
- Age structure – old growth, regrowth, mixture
- Weeds – species, degree of dominance and extent (% of area)

*Soil*

- Erosion features – (rills, gullies, sheet) extent (% of area), type and severity;
- Surface condition – litter and/or cryptogamic cover, organic matter incorporation, structure, friability/compaction.

### Attachment C: Protocols for thinning of regrowth in the offset areas *DRAFT*

Thinning dense stands of small regrowth trees, if carefully designed, can assist biodiversity by returning a forest system to a natural structure more rapidly than is possible through natural attrition. The following guidelines for ecological thinning can be applied where it is judged by qualified ecologists that stands of small trees exist at unusually high densities.

Category	Guidelines
1. Site selection	Thinning should be applied only to localised areas that are dominated by trees less than 15 cm diameter at breast height (DBH). Thinning will not be applied to areas where basal area is less than 20 m <sup>2</sup> per ha.
2. Tree size	Only trees less than 15 cm DBH will be cut.
3. Area	A mosaic of thinning is required, with some areas left unthinned across the landscape. Each thinning operation will be conducted within a defined site of no more than 2 ha.
4. Percent of area	To further guide the creation of a mosaic, within the 2 ha defined site no more than 50% of the area will be thinned, preferably as small plots of less than 900 m <sup>2</sup> (30 X 30 m).
5. Basal area target	Thinning will be designed so that remaining basal area in the thinned plots is greater than 20 m <sup>2</sup> .

## **Appendix J.      Indicative Staging Plan**

## **1. Indicative Staging Plan**

The following tables describe the general staging of tasks to be conducted during the various stages associated with the Armidale Landfill project. These stages are not necessarily consecutive and there will be overlaps in many stages. The intention is to give an overview of the order in which works will commence.

Five (5) main stages have been identified during this project and include:

1. Stage 1 – Pre-clearing (Table 1);
2. Stage 2 – Clearing (Table 2);
3. Stage 3 – Construction (Table 3);
4. Stage 4 – Operation (Table 4); and
5. Stage 5 – Rehabilitation/Post Closure (Table 5).

**Table 1. Stage 1 - Pre-clearing Tasks**

Management Theme	Action Description	Comments
Native Fauna Management/Vegetation Management	Flora and fauna assessment.	Determine if any change has occurred from previous assessment.
Vegetation Management	Seed and sapling collection.	Seeds and saplings to be taken from the landfill pit area and either immediately replanted in offset area or stored for future replanting of spent cells. Specific management requirements pertaining to rehabilitation and revegetation of the site can be found in Section 4.4 for the Vegetation Management Plan (Appendix E).
Vegetation Management	Seed propagation and planting of tube stock.	Direct seeding and/or propagation of tube stock to be conducted in spring/summer prior to commencement of works. Refer to Vegetation Management Plan for more information.
Weed Management	Identification and disposal of noxious weeds.	For detailed information refer to Weed Management Plan.
Weed Management/Vegetation Management	Identification of soil stock pile areas.	For detailed information refer to Weed Management Plan and Vegetation Management Plan.
Vegetation Management	Identification of monitoring plots.	For detailed information refer to Vegetation Management Plan.
Vegetation Management/Native Fauna Management	Identification of hollow bearing trees, hollow logs and other habitat features to be located and recorded by GPS.	For detailed information refer to Vegetation Clearing Protocol.
Pest Management	Removal of livestock from project area.	
Vegetation Management/Native Fauna Management	Identification and establishment of offset area.	Vegetation offsets shall be developed at a 3:1 ratio of offset to impact area (i.e. three times more revegetated area than the area quarantined for landfilling purposes). Offset areas will protect and allow regeneration of approximately 61ha of land within the overall development area, in accordance with the Biodiversity Offset Management Plan (EA Systems, 2010b).
Native Fauna Management	Installation of artificial nest boxes.	For detailed information refer to the Native Fauna Management Plan.
Pest Management	Installation of fencing.	Minimum fencing criteria can be found in Table 3 of the Pest Management Plan.

Management Theme	Action Description	Comments
Pest Management	Assessment of rabbit, fox and feral cat populations.	
Pest Management	Baiting program with 1080 poison or similar.	Refer to Pest Management Plan for more detail.
Vegetation Management	Planting of vegetative buffers.	Vegetated buffers will be planted along the access road and around the landfill pit and infrastructure areas (within the offset areas and outside the landfill perimeter fencing). These areas will be established and planted in the early stages of the project. Removal of existing vegetation from the landfill pit will be delayed as long as possible to achieve maximal overlap.
Vegetation Management	Pre-clearing report.	Refer to Vegetation Management Plan and Vegetation Clearing Protocol for more detail.

**Table 2. Stage 2 - Clearing Tasks**

Management Theme	Action Description	Comments
Native Fauna Management	Prior to felling, each tree will be visually inspected for the presence of fauna and shaken.	Refer to Vegetation Clearing Protocol for more information.
Native Fauna Management	Dozer or excavator 'slow drop' trees.	Refer to Vegetation Clearing Protocol for more information.
Native Fauna Management	Once on the ground, each hollow will be inspected for fauna. Hollow bearing tree to be left on the ground overnight.	Refer to Vegetation Clearing Protocol for more information.
Native Fauna Management	Hollow-bearing stags in the grassland and hollow-bearing trees from Stringybark Woodland in the landfill area will be relocated to offset areas as logs, or erect as stags if feasible, in line with OEH recommendations.	Refer to Vegetation Clearing Protocol for more information.
Native Fauna Management	Monitoring for native fauna at and surrounding the project site.	Refer to Native Fauna Management Plan.
Vegetation Management	Vegetation clearing report.	Refer to Vegetation Clearing Protocol for more information.
Pest Management	Continued monitoring of pest and baiting program with 1080 poison or similar if necessary.	Refer to Pest Management Plan for more detail.
Weed Management	Monitoring and disposal of noxious weeds.	Refer to Weed Management Plan for more information.
Weed Management	The top 100-300 mm of soil removed from the landfill pit needs to be retained and stored for later rehabilitation of the pit (Minerals Council of Australia 1998). It may be feasible to double-strip the topsoil and remove the top 50 mm of soil separately.	Refer to Weed Management Plan and Vegetation Management Plan for more detail.
Weed Management/Vegetation Management	Stockpiling of soils in accordance with Vegetation Management Plan and Vegetation Clearing Protocol.	Refer to Weed Management Plan and Vegetation Management Plan for more detail.
Pest Management	Harbour destruction including the dismantling of log piles and the destruction of blackberry thickets and warrens.	Refer to Pest Management Plan for more detail.

**Table 3. Stage 3 – Construction Tasks**

Management Theme	Action Description	Comments
Weed Management/Vegetation Management	Stockpiling of soils in accordance with Vegetation Management Plan and Vegetation Clearing Protocol.	Refer to Weed Management Plan and Vegetation Management Plan for more detail.
Weed Management	The top 100-300 mm of soil removed from the landfill pit needs to be retained and stored for later rehabilitation of the pit (Minerals Council of Australia 1998). It may be feasible to double-strip the topsoil and remove the top 50 mm of soil separately.	Refer to Weed Management Plan and Vegetation Management Plan for more detail
Weed Management	Monitor and control weeds following ground disturbance and construction works; use only non-residual herbicides and those without surfactants (spreading agents) in the vicinity of drainage lines (surfactants can lead to suffocation of amphibians).	Refer to Weed Management Plan for more detail.
Fire Management	A firebreak shall be constructed around the perimeter of the landfill pit and the perimeter of the biodiversity offset areas (stringy part and grassland).	Refer to Fire Management Plan for more detail.
Disease Management/Weed Management	Weed control including vehicle wash down.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Disease Management/Weed Management	Effective drainage of surface water runoff to capture and prevent the spread of seeds and vectors.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Pest Management	Continued monitoring of pest; implementation of appropriate mitigation methods.	Refer to Pest Management Plan for more detail.
Pest Management	Monitoring and maintenance of established fencing.	Refer to Pest Management Plan for more detail.
Pollution Management	Dust, soil erosion, noise, surface water pollution management.	Refer to Pollution Management Plan for more detail.
Pollution Management	Establishment of groundwater monitoring wells.	
Native Fauna Management	Monitoring of native fauna.	Refer to Native Fauna Management Plan.



**Table 4. Stage 4 – Operation Tasks**

Management Theme	Action Description	Comments
BOMP and associated management plans	Annual monitoring and reporting performance and compliance with mitigation measures outlined in the BOMP and associated management plans.	Refer to BOMP and management plans for more detail.
Vegetation Management	Monitoring of native regrowth. If understorey regeneration is not satisfactory in areas left for natural regeneration after one year, selected replanting of shrubs and saplings will be necessary in treeless gaps throughout the Stringybark Woodland. The natural recruitment of shrubs has been shown to be episodic and disturbance driven, and these species may require planting from tube stock. Planting and seeding is best undertaken following autumn rains in cool, wet conditions to ensure maximum success.	Refer to BOMP and Vegetation Management Plan for more detail.
Weed Management	Weed control will continue for up to five (5) years after planting/seeding of offset areas and spent landfill cells. Two comprehensive searches for weeds will be implemented each year, one in late spring (November) and another in late summer (February).	Refer to Weed Management Plan and Vegetation Management Plan for more detail.
Weed Management	Monthly site inspections for weeds. The frequency of the site inspections may need to be altered throughout the lifetime of the landfill.	Refer to Weed Management Plan for more detail.
Fire Management	Monitoring and maintenance of fire barriers and fire hazards.	Refer to Fire Management Plan for more detail.
Fire Management	Fuel load reduction including slashing and clearance/removal of vegetation adjacent to the landfill.	Refer to Fire Management Plan for more detail.
Disease Management/Weed Management	Wash down vehicles to remove weeds and weed seeds to prevent spread to new areas. Wash down will occur in a dedicated area where runoff can be contained and weeds treated.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Disease Management/Weed Management	Ensure that all materials imported onto the site are weed and disease free.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Disease Management/Weed Management/Pollution Management	Effective drainage of surface water runoff to capture and prevent the spread of seeds, vectors and nutrients.	Refer to Disease Management Protocol and Weed Management Plan for more detail.

Management Theme	Action Description	Comments
Pest Management	Continual monitoring of targeted pest numbers to identify effectiveness of management plan. Monitoring will also assess whether propagation is occurring thus allowing for quick action in preventing outbreaks. Implementation of appropriate mitigation methods.	Refer to Pest Management Plan for more detail.
Pest Management	Monitoring and maintenance of established fencing.	Refer to Pest Management Plan for more detail.
BOMP	Undertake an independent environmental audit within a year of the commencement of operation of the project, and every 3 years thereafter.	Refer to BOMP for more detail.
BOMP and management plans	Monthly inspections to monitor environmental performance and compliance.	Refer to BOMP and management plans for requirements.
Pest Management/ Pollution Management/Disease Management	Continual compaction and coverage of waste with the landfill.	
Pollution Management	Dust, gas, soil erosion, noise, surface water pollution monitoring and management.	Refer to Pollution Management Plan for more detail.
Native Fauna Management	Monitoring of native fauna. Sighting of native fauna to be recorded and records maintained with Council.	Refer to Native Fauna Management Plan.

**Table 5. Stage 5 – Rehabilitation/Post closure Tasks**

Management Theme	Action Description	Comments
BOMP and associated management plans	Annual monitoring and reporting performance and compliance with mitigation measures outlined in the BOMP and associated management plans.	Refer to BOMP and management plans for more detail.
Vegetation Management	To re-establish sustainable native vegetation on the spent landfill cells, the rehabilitation will commence with landform design and the reconstruction of a stable land surface prior to replacing the topsoil.	Refer to the landfill Closure/Rehabilitation Plan.
Vegetation Management	Monitoring of native regrowth. If understorey regeneration is not satisfactory in areas left for natural regeneration after one year, selected replanting of shrubs and saplings will be necessary in treeless gaps throughout the Stringybark Woodland. The natural recruitment of shrubs has been shown to be episodic and disturbance driven, and these species may require planting from tube stock. Planting and seeding is best undertaken following autumn rains in cool, wet conditions to ensure maximum success.	Refer to BOMP and Vegetation Management Plan for more detail.
Weed Management	Monthly site inspections for weeds. The frequency of the site inspections may need to be altered throughout the lifetime of the landfill.	Refer to Weed Management Plan for more detail.
Fire Management	Monitoring and maintenance of fire barriers and fire hazards.	Refer to Fire Management Plan for more detail.
Fire Management	Fuel load reduction including slashing and clearance/removal of vegetation adjacent to the landfill.	Refer to Fire Management Plan for more detail.
Disease Management/Weed Management	Stripped topsoil to be tested prior to use.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Disease Management/Weed Management/Pollution Management	Effective drainage of surface water runoff to capture and prevent the spread of seeds, vectors and nutrients.	Refer to Disease Management Protocol and Weed Management Plan for more detail.
Pest Management	Continual monitoring of targeted pest numbers to identify effectiveness of management plan. Monitoring will also assess whether propagation is occurring thus allowing for quick action in preventing outbreaks. Implementation of appropriate mitigation methods.	Refer to Pest Management Plan for more detail.
Pest Management	Monitoring and maintenance of established fencing.	Refer to Pest Management Plan for more detail.

Management Theme	Action Description	Comments
BOMP	Undertake an independent environmental audit within a year of the commencement of operation of the project, and every 3 years thereafter.	Refer to BOMP for more detail.
Pest Management/ Pollution Management/Disease Management	Once landfill cell has reached its capacity, it will be capped.	Refer to the landfill Closure/Rehabilitation Plan.
Pollution Management	Dust, soil erosion, noise, surface water pollution monitoring and management.	Refer to Pollution Management Plan for more detail.

## **Appendix K. Flora Species Recorded On-Site**

**Table 1.** Flora species observed in the study area on 3 April 2005, 15 October 2005 and 18 September 2006  
V=Vulnerable Species (TSC act and EPBC Act); R=ROTAP species; TSR=Travelling Stock Reserve;  
\*= introduced species, \*\*= exotic species listed as noxious weeds for the Armidale Dumaresq LGA.

Status	Scientific name	Common name	Study site	TSR
<b>Trees</b>				
	<i>Acacia filicifolia</i>	Fern-leaved Wattle	✓	✓
	<i>Allocasuarina littoralis</i>	Black She-oak	✓	
	<i>Banksia integrifolia</i> subsp. <i>monticola</i>	Banksia		✓
	<i>Angophora floribunda</i>	Rough-barked Apple		✓
	<i>Eucalyptus blakelyi</i>	Blakelys Red Gum	✓	✓
	<i>Eucalyptus bridgesiana</i>	Apple-topped Box		✓
	<i>Eucalyptus caliginosa</i>	New England Stringybark	✓	✓
R	<b><i>Eucalyptus elliptica</i></b>	Bendemeer White Gum		✓
	<i>Eucalyptus melliodora</i>	Yellow Box	✓	✓
V	<b><i>Eucalyptus nicholii</i></b>	Narrow-leaved Black Peppermint		✓
	<i>Exocarpus cuppresiformis</i>	Native Cherry		✓
<b>Shrubs</b>				
	<i>Acacia dawsonii</i>	Poverty Wattle		✓
	<i>Acacia ulicifolia</i>	Prickly Moses	✓	✓
	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	Blackthorn	✓	✓
	<i>Cassinia laevis</i>	Cough Bush	✓	✓
	<i>Cassinia quinquefaria</i>	Cough Bush	✓	✓
*	<i>Crataegus monogyna</i>	Hawthorn	✓	✓
	<i>Cryptandra amara</i>	Bitter Cryptandra		✓
	<i>Cryptandra propinqua</i>	Cryptandra		✓
	<i>Daviesia genistifolia</i>	Broom Bitter Pea	✓	✓
	<i>Daviesia latifolia</i>	Broad-leaved Bitter Pea	✓	✓
	<i>Dillwynia sieberi</i>	Spiny Parrot Pea		✓
	<i>Grevillea juniperina</i>	Juniper-leaved Grevillea		✓
	<i>Hibbertia linearis</i>	Guinea Flower	✓	
	<i>Hibbertia obtusifolia</i>	Guinea Flower	✓	✓
	<i>Hibbertia riparia</i>	Guinea Flower	✓	✓
	<i>Hovea linearis</i>	Hovea		✓
	<i>Indigofera australis</i>	Hill Indigo	✓	✓
	<i>Jacksonia scoparia</i>	Dogwood	✓	✓
	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	Chinese Lespedeza		✓
	<i>Lissanthe strigosa</i>	Peach Heath	✓	✓
	<i>Maytenus silvestris</i>	Narrow-leaved Orangebark		✓
	<i>Melichrus urceolatus</i>	Urn Heath		✓
	<i>Olearia viscidula</i>	Sticky Daisy Bush		✓
	<i>Phyllanthus virgatus</i>	Small Spurge	✓	

Status	Scientific name	Common name	Study site	TSR
	<i>Pimelea curviflora</i> var. <i>divergens</i>	Curved Riceflower	✓	✓
	<i>Pultenaea microphylla</i>	Spreading Bush-Pea	✓	✓
**	<i>Rosa rubiginosa</i>	Sweet Briar	✓	✓
**	<i>Rubus fruticosus</i> s.l.	Blackberry	✓	✓
	<i>Rubus parvifolius</i>	Native Raspberry	✓	✓
<b>Vines/climbers</b>				
	<i>Glycine clandestina</i>	Glycine	✓	✓
	<i>Glycine tabacina</i>	Variable Glycine	✓	✓
	<i>Hardenbergia violacea</i>	Purple Twining-Pea		✓
<b>Mistletoes</b>				
	<i>Amyema micquellii</i>	Mistletoe		✓
	<i>Amyema pendulum</i>	Drooping Mistletoe	✓	✓
<b>Grasses</b>				
	<i>Aristida ramosa</i>	Purple Wiregrass	✓	✓
	<i>Aristida vagans</i>	Wiregrass	✓	✓
	<i>Austrodanthonia laevis</i>	Wallaby Grass	✓	✓
	<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Slender Wallaby Grass	✓	✓
	<i>Austrodanthonia richardsonii</i>	Wallaby Grass	✓	
	<i>Austrostipa rudis</i>	Tall Speargrass	✓	✓
	<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Rough Speargrass	✓	✓
	<i>Bothriochloa decipiens</i>	Red-leg Grass	✓	
	<i>Bothriochloa macra</i>	Red-leg Grass	✓	✓
*	<i>Briza minor</i>	Quivering Grass	✓	
	<i>Chloris ventricosa</i>	Tall Chloris	✓	
*	<i>Chloris virgata</i>	Feathertop Rhodes Grass	✓	
	<i>Cymbopogon refractus</i>	Barb-wire Grass	✓	✓
	<i>Cynodon dactylon</i>	Couch	✓	
	<i>Dichelachne micrantha</i>	Slender Plume Grass	✓	✓
	<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	Hedgehog Grass	✓	✓
*	<i>Eleusine tristachya</i>	Goose Grass	✓	
	<i>Elymus scaber</i>	Wheat Grass	✓	✓
*	<i>Enneapogon nigricans</i>	Niggerheads	✓	
**	<i>Eragrostis curvula</i>	African Lovegrass	✓	✓
	<i>Eragrostis leptostachya</i>	Small Lovegrass	✓	✓
	<i>Eragrostis molybdea</i>	Lovegrass	✓	✓
	<i>Lachnagrostis avenaceus</i>	Blown Grass	✓	✓

Status	Scientific name	Common name	Study site	TSR
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Meadow Rice Grass	✓	✓
	<i>Panicum effusum</i>	Hairy Panic	✓	✓
*	<i>Paspalum dilatatum</i>	Paspalum	✓	
	<i>Paspalum distichum</i>	Water Couch	✓	
	<i>Pennisetum allopecuroides</i>	Swamp Foxtail	✓	
	<i>Poa sieberiana</i>	Snow Grass	✓	✓
*	<i>Setaria gracilis</i>	Pigeon Grass	✓	
	<i>Sarga leiocladum</i>	Native Sorghum	✓	✓
	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	✓	✓
	<i>Themeda australis</i>	Kangaroo Grass	✓	✓
<b>Herbs</b>				
	<i>Acaena ovina</i>	Sheep's Burr		✓
*	<i>Acetosella vulgaris</i>	Wood Sorrel	✓	✓
	<i>Ajuga australis</i>	Austral Bugle		✓
*	<i>Anagallis arvensis</i>	Scarlet Pimpernell	✓	✓
	<i>Asperula conferta</i>	Woodruff	✓	✓
*	<i>Aster subulatus</i>	Wild Aster	✓	✓
	<i>Bidens subalternans</i>	Greater Beggar's Ticks		✓
	<i>Brachycome nova-anglica</i>	New England Brachycome		✓
	<i>Brunoniella australis</i>	Blue Trumpet		✓
	<i>Bulbine bulbosa</i>	Bulbine Lily		✓
	<i>Calotis cuneifolia</i>	Purple Burr-daisy	✓	✓
	<i>Calotis lappulacea</i>	Tangled Burr-daisy	✓	
	<i>Carex appressa</i>	Tall Sedge	✓	✓
	<i>Carex breviculmis</i>	A Small Sedge		✓
*	<i>Centaurium erythraea</i>	Common Centaury	✓	✓
	<i>Centella asiatica</i>	Pennywort	✓	
	<i>Centipeda minima</i>	Spreading Sneezeweed	✓	
	<i>Cheilanthes distans</i>	Hairy Mulga Fern	✓	
	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Mulga Fern	✓	✓
	<i>Chrysocephalum apiculatum</i>	Clustered Everlasting	✓	✓
*	<i>Cirsium vulgare</i>	Spear Thistle	✓	✓
*	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	✓	✓
	<i>Craspedia canens</i>	Grey Billy-buttons		✓
	<i>Crassula sieberiana</i>	Australian Stonecrop		✓
	<i>Cymbonotus lawsonianus</i>	Bear's Ear	✓	✓
	<i>Cynoglossum australe</i>	Native forget-me-not		✓
*	<i>Cyperus eragrostis</i>	Umbrella Sedge	✓	✓
	<i>Cyperus gracilis</i>	Slender Sedge	✓	✓



Status	Scientific name	Common name	Study site	TSR
	<i>Cyperus lhotskyanus</i>	Sedge	✓	
	<i>Cyperus sanguinolentus</i>	Sedge		✓
	<i>Cyperus sphaeroideus</i>	Sedge	✓	✓
	<i>Desmodium brachypodum</i>	Large Tick-trefoil	✓	✓
	<i>Desmodium gunnii</i>	Tick-trefoil	✓	✓
	<i>Desmodium varians</i>	Slender Tick-trefoil	✓	✓
	<i>Dianella revoluta</i> var. <i>vinosa</i>	Flax Lily		✓
	<i>Dichondra</i> sp. A	Kidney Weed	✓	✓
	<i>Dipodium</i> sp.	Hyacinth Orchid		✓
	<i>Diuris chrysantha</i>	Donkey Orchid		✓
	<i>Elatine gratioloides</i>	Waterwort	✓	
	<i>Eleocharis acuta</i>	Spikerush	✓	✓
	<i>Euchiton sphaericus</i>	Cudweed	✓	✓
	<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	✓	✓
*	<i>Gamochaeta spicata</i>	Spiked Cudweed	✓	✓
	<i>Geranium solanderi</i> var. <i>solanderi</i>	Native Geranium	✓	✓
	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	Ivy Goodenia	✓	✓
	<i>Goodenia pinnatifida</i>	Goodenia	✓	✓
	<i>Haloragis heterophylla</i>	Raspwort	✓	✓
	<i>Hydrocotyle laxiflora</i>	Stinking pennywort		✓
	<i>Hypericum gramineum</i>	Small St. John's Wort	✓	✓
*	<i>Hypochaeris radicata</i>	Catsear	✓	✓
	<i>Hypolepis glandulifera</i>	Downy Ground-fern	✓	
	<i>Isolepis</i> sp.	Small Clubrush	✓	✓
	<i>Juncus filicaulis</i>	Rush		✓
	<i>Juncus planifolius</i>	Broad Rush		✓
	<i>Juncus</i> sp.	Rush	✓	✓
	<i>Juncus usitatus</i>	Rush	✓	✓
*	<i>Lepidium africanum</i>			✓
	<i>Leptorynchos squamatus</i>	Yellow Buttons		✓
	<i>Lomandra filiformis</i>	Slender Mat-rush	✓	✓
	<i>Lomandra longifolia</i>	Spiny Mat-rush		✓
	<i>Mentha diemenica</i>	Pennyroyal	✓	✓
	<i>Opercularia hispida</i>	Hairy Stinkweed		
	Orchid - ground	unknown sp, rosette lvs		✓
	<i>Oxalis exilis</i>	Soursob	✓	✓
*	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort	✓	✓
	<i>Pellaea falcata</i>	Sickle Fern	✓	
	<i>Persicaria lapathifolia</i>	Knotweed	✓	
	<i>Persicaria prostrata</i>	Spreading Knotweed	✓	✓

Status	Scientific name	Common name	Study site	TSR
*	<i>Petrorhagia nanteulii</i>			✓
*	<i>Phytolacca octandra</i>	Inkweed	✓	
	<i>Plantago gaudichaudii</i>	Slender Plantain		✓
*	<i>Plantago lanceolata</i>	Lamb's Tongue	✓	✓
	<i>Podolepis</i> sp.	Copper Daisy		✓
*	<i>Polygonum aviculare</i>	Wireweed	✓	
	<i>Poranthera microphylla</i>	A Euphorb		✓
	<i>Ranunculus lappaceus</i>	Common Buttercup		✓
	<i>Ranunculus pumilio</i>	Small Buttercup	✓	
	<i>Rumex brownii</i>	Swamp Dock	✓	✓
*	<i>Sanguisorba minor</i>	Salad Burnet		✓
	<i>Scleranthus biflorus</i>	Knawel		✓
	<i>Senecio gunnii</i>	A senecio		✓
	<i>Stackhousia monogyna</i>	Creamy Candles	✓	✓
*	<i>Taraxacum officinale</i>	Dandelion		✓
*	<i>Trifolium campestre</i>	Hop Clover	✓	
*	<i>Trifolium repens</i>	White Clover		✓
	<i>Triptilodiscus pygmaeus</i>	Small Sunray	✓	
	<i>Typha orientalis</i>	Broad-leaved Cumbungi		✓
	<i>Urtica incisa</i>	Stinging Nettle	✓	✓
*	<i>Urtica urens</i>	Stinging Nettle	✓	
*	<i>Verbascum thapsus</i>	Great Mullein	✓	
*	<i>Verbascum virgatum</i>	Green Mullein		✓
*	<i>Verbena bonariensis</i>	Purple Top	✓	✓
	<i>Veronica plebeia</i>	Trailing Speedwell		✓
	<i>Viola betonicifolia</i>	Native Violet		✓
	<i>Vittadinia muelleri</i>	Dissected Fuzzweed		✓
	<i>Vulpia bromoides</i>	Squirrel Tail Fescue		
	<i>Wahlenbergia communis</i>	Bluebell	✓	✓
**	<i>Xanthium spinosum</i>	Bathurst Burr	✓	
<b>Aquatic plants</b>				
	<i>Ottelia ovalifolia</i>	Swamp Lily	✓	
	<i>Vallisneria gigantea</i>	Ribbonweed	✓	

## **Appendix L.     Site Photos**





**Figure 1.** Groundcover in Stringybark Woodland proposed landfill pit impact area



**Figure 2.** Groundcover in Stringybark Woodland proposed offset groundcover area





**Figure 3.** Dense regrowth in Stringybark Woodland offset area



**Figure 4.** Cleared grassland in proposed landfill pit impact area





**Figure 5.** Proposed landfill pit impact area in Stringybark Woodland. The area is dominated by mature regrowth with few remnant mature emergent trees.



**Figure 6.** Log piles in the Stringybark Woodland of the proposed landfill pit impact area





**Figure 7.** Blackberry shrubs (noxious weed) in the log piles within the Stringybark Woodland proposed landfill pit impact area

## **Appendix M.     BOMP Protocol**



## BOMP Review Proforma

BOMP Section	Clause	Complaint	Evidence/comment	Recommendation
4.0	Roles and Responsibilities			
5.1	Fencing and Removal of Livestock			
5.2	Rehabilitation and Revegetation			
5.3 and Vegetation Management Plan	Clearing vegetation/removal of mature trees			
5.4 and Weed Management Plan	Weed control			
5.5 and Pest Management Plan	Pest management			
5.2 and Vegetation Management Plan	Seed Collection and Propagation			
5.2, 6.2 and Vegetation Management Plan	Revegetation <ul style="list-style-type: none"> <li>Cover crop</li> <li>Overstorey</li> <li>Understorey</li> </ul>			
5.3, 6.2, 6.3, Vegetation Management Plan and Native Fauna Management Plan	Habitat Augmentation <ul style="list-style-type: none"> <li>Terrestrial and arboreal habitat structure</li> <li>Food Resources</li> </ul>			
5.4 and Weed Management Plan	Weed Management			
5.5 and Pest Management Plan	Pest Management			
5.1 and Pest Management Plan	Fence and Access Management			
5.2.2 and Vegetation Management Plan	Erosion and Sedimentation Control			
Fire Management Plan	Fire Management			
Disease Monitoring Protocol	Disease Management			
Pollution and Litter Management Plan	Pollution and Litter Control			
5.7 and Native Fauna Management Plan	Native Fauna Management including Koala and Little Eagle			
6.0	Monitoring and Review			

## **Appendix N.     OEH Monitoring Protocol**

**MONITORING PROTOCOLS FOR ARMIDALE  
LANDFILL CONSERVATION AGREEMENT**

**ESTABLISHED AS A CONDITION OF CONSENT  
TO DEVELOPMENT**

**Prepared by Armidale Dumaresq Council**

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**1 RESULTS OF MONITORING TO DATE/MONITORING RPORT****1.1 CURRENT WORKS BEING UNDERTAKEN UNDER THE EMP**

Description of work undertaken	Source of funding and amount	Date completed

**1.2 FIRE HISTORY MONITORING**

Date of fire	Area burnt (% of c.a./approx ha)	Reason (hazard red./wild)	Intensity (low/medium/high)

**1.3 VISITATION**

Average No. of Visitors per year	Purpose of Visitation	Visitation effects	Strategies to overcome effects

**1.4 COMMUNITY CONSULTATION AND INPUT INTO DECISION MAKING**

Type of Involvement	Numbers involved	Outcomes



**1.5 CONSERVATION VALUES**

	Conservation Values noted in Agreement and its significance	Current condition	Current and emerging threats	Level and extent of threats	New findings; any other relevant information.
Landscape/ Catchment - World/national heritage listings - Landscape & scenic values					
Biological - Vegetation Communities - Flora - Fauna & habitat - Water bodies					
Geological					
Cultural Heritage - Aboriginal - Historic					
Research/ education					
Other					

**1.6 MANAGEMENT ISSUES**

	<b>Describe the Issue</b> (short description of current extent of impacts, new sightings and any other relevant information)	<b>Description of planning and implementation of control measures being and to be undertaken, and duration</b>
Weeds (where applicable, infestation can be given as a % of total vegetation)		
Pest Animals - Feral - Domestic - Native		
Fire Management		
Threatened species; endangered ecological communities etc		
Cultural Heritage Management		
Visitor Impact Management		
Community Consultation and input into decision making.		
Research/ Education programs		



	<b>Describe the Issue</b> (short description of current extent of impacts, new sightings and any other relevant information)	<b>Description of planning and implementation of control measures being and to be undertaken, and duration</b>
Other issues - <i>Phytophthora</i> - vehicle access		



**1.7 WORKPLAN TO ADDRESS MANAGEMENT ISSUES (in priority order)**

Action to be completed or ongoing action (discuss on site and where necessary confirm details later)	Cost and possible funding sources	Completion Date	Responsibility (landholder, NPWS, other)



**1.8 BIOMETRIC AND CONDITION ASSESSMENT SCORES**

	2013		2014		2015		2016		2017	
	Biometric Plot	Condition Assessment	Biometric Plot	Condition Assessment	Biometric Plot	Condition Assessment	Biometric Plot	Condition Assessment	Biometric Plot	Condition Assessment
Site 1										
Site 2										
Site 3										
Site 4										
Site 5										
Site 6										
Site 7										
Site 8										
Site 9										



## 2 ATTACHMENTS

- ☐ Map showing location of activities referred to above eg weed infestations; fire; location of past and future management actions.

List further attachments if relevant:

- ☐ Photos from previously/new identified photo-points
- ☐ Rapid Assessment Sheets for previous/new sites.
- ☐ Other Monitoring results.

I/we confirm a field inspection has been undertaken and this form is a summary of the conservation values and management issues discussed.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_  
On behalf of Landowner                      OEH Officer/contractor

Date report completed: \_\_\_\_\_



### **3 PHOTO-POINTS AND CONDITION ASSESSMENTS**

#### **3.1 Photo-point 1**

##### **3.1.1 Photos: Photo-point 1**

North

West

East

South



**3.1.2 Biometric data sheet: Photo-point 1****Site Value – plot data sheet**

Start a new sheet for each zone.

*Biometric*

SITE NO

ZONE NO

RECORDERS

LOCATION DESCRIPTION:

DATE:

LAND TENURE

LAND MANAGER

Vegetation formation  
(as per Keith 2004)Vegetation class  
(as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002):

CMA :

AMG (GPS datum: GDA94)

Benchmarks

1

2

3

4

Easting	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Northing	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**20 x 20m plot**

Number of native plant species	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Native over-storey cover (%) -use alternative method below if appropriate	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Native mid-storey cover (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Native ground cover – grasses (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Native ground cover – shrubs (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Native ground cover – other (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Exotic plant cover (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)

**Larger sampling area (20m x 50m plot, or whole of zone)**

Number of trees with hollows - use alternative method below if appropriate	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Over-storey regeneration (proportion of over-storey spp)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Total length of fallen logs (m)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Notes:

Fauna observed:

Width of Riparian Zone in Metres:	<input type="text"/>	N/A
-----------------------------------	----------------------	-----



	Photo Point Numbers and description
Looking North	
Looking East	
Looking South	
Looking West	

**Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq$  5cm DBH, no height limits).

Cover abundance scale 1-7	
1	
2	
3	
4a	
4b	
5	
6	
7	



Conservation  
International

## Disturbance Data

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light		High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

## Habitat Features

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Peeling Bark	Fissures	Cracks	Stick Nests
Soil Cracks	Rocky areas	Caves	Mud Nests
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Mistletoe	Acacia Sp	Termite Mounds	Casuarina Sp
Dam	Creek	River	Dead Trees

Is there a presence of

## Other Valuable Habitat Features

	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites		Rock Outcrops/Formations	
Habitat Garden/Constructed water feature		Weedy vegetation used as habitat	
Ground foraging		Built structures/non-	





habitat		structural features used as habitat	
---------	--	----------------------------------------	--



**3.1.3 Condition assessment: Photo-point 1****CONDITION ASSESSMENT - NATIVE VEGETATION**

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name:	Monitoring date:
Assessment questions	Answer Yes, No or N/A
1. Is the area fenced to manage stock access and grazing? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	
2. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	
3. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	
4. If grassland, is there a diverse range of grasses and broad leaf herbs present?	
5. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	
6. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	
7. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	
8. Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	
9. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	
10. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	
11. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory.</i>	
12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	
13. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	



15. Are there standing trees (alive or dead) with hollows, present in the remnant or paddock? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	
16. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	
17. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	
18. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	
19. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled</i>	
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	
22. Is the area free from the threat of salinity and / or high water tables?	
<b>Total number of 'yes' answers</b>	

Condition rating - native vegetation				
Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	<b>Healthy</b>	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**Note: Condition Assessment can be carried out on a number of sites to reflect the different vegetation types and conditions. Sites can be selected to reflect relative importance and size of each vegetation type.**





## **Appendix O.     Monitoring Checklist**

## **Monitoring Checklist – Armidale Regional Landfill Facility, Waterfall Way**

INSPECTION BY:

SIGNATURE:

DATE:

N/A	Mitigation Measure	Satisfactory Yes	No	Action Priority 1 2 3 4				Brief Description of Action Required	Initial for Close-Out of Action
	<b>General Management</b>								
<input type="checkbox"/>	Condition of landfill perimeter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Waste screening controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Waste placement practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Waste covering procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Waste compaction procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of landfill fences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Landfill maintenance and cleanliness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Workers and others appropriately inducted and trained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<b>Disease Monitoring</b>								
<input type="checkbox"/>	No indication of disease outbreak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of security system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<b>Fire Management</b>								
<input type="checkbox"/>	Landfill gas measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Fire risks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of perimeter firebreak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Fire-fighting equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Storage and handling of chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<b>Pest Management</b>								
<input type="checkbox"/>	Presence of pests or fecal droppings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	No domestic animals present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Number of native fauna killed during pest control procedures (baiting, shooting, harbor destruction etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

N/A	Mitigation Measure	Satisfactory		Action Priority				Brief Description of Action Required	Initial for Close-Out of Action
		Yes	No	1	2	3	4		
	<b>Native Fauna Management</b>								
<input type="checkbox"/>	Condition of artificial nest boxes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Relocation of hollows and stags	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Spotter Catcher reports and fate of animals captured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Number of native animals killed during vegetation clearing activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Fauna sightings records maintained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Light nuisance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Fauna monitoring areas established and maintained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Licensed Spotter Catcher used when required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Appropriate release sites chosen for the relocation of fauna	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Wildlife load reduced prior to clearing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Pre-clearance surveys conducted appropriately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<b>Pollution Management</b>								
<input type="checkbox"/>	Surface water sampling conducted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Groundwater sampling conducted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Landfill gas monitoring conducted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Noise monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	conducted/complaints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Dust monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	conducted/complaints?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Odour complaints?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Litter inspection of gates and fences. Any complaints?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

<b>Weed Management</b>									
<input type="checkbox"/>	Presence of noxious weeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Effectiveness of control methods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of wheel wash facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Imported topsoil is certified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Weed material appropriately disposed of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Weed infested areas avoided where possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Traffic limited to designated access tracks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Personnel aware of weed infestation areas and their obligations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<b>Vegetation Management</b>									
<input type="checkbox"/>	Timing of vegetation clearing activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Under scrubbing conducted prior to removal of overstory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Timing of removal of habitat trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Hollow bearing trees assessed prior to clearing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Structural complexity achieved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Vegetation clearing protocol followed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Offset areas established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of revegetated areas (incl. offset areas)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Native seed and sapling procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Storage of native seeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Vegetation buffers established and maintained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Disturbed areas rehabilitated and revegetated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Planting and seeding practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Soil stripping activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Stockpile management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Appropriate use of tree guards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of tree guards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Application of erosion and sediment controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	Condition of erosion and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		



<input type="checkbox"/>	sediment controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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Other Items	Priority	Actions Required	Closed