



# Subdivision and Urban Development at Catherine Hill Bay

## Weed Management Plan

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A	Weed Management Plan	LW	MD	10-12-2013

Approval for Issue

Name	Signature	Date
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## 1.0 Introduction

### 1.1 Project Description

Coastal Hamlets Pty Ltd is undertaking a residential subdivision and development at Catherine Hill Bay (the Project). The Project occurs within the Lake Macquarie Local Government Area (LGA), on the New South Wales central coast, approximately 29 kilometres south of Newcastle.

The Project Area covers 72 hectares and involves the subdivision of land and construction of 549 dwellings on the site of the former Moonee Colliery. The Project comprises seven stages, with works to begin in Stage 1 (Figure 1). Associated works include the construction of an internal road network and installation of utilities including electricity and water.

The Project Area is dominated by existing cleared areas; vegetation was removed for past mining operations. These cleared areas support disturbed and degraded native vegetation and a diversity of exotic species and noxious weeds, including dense infestations of *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana).

The Minister for Planning approved the Residential Subdivision at Catherine Hill Bay under part 75J (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 18 May 2011, subject to the Minister's Conditions of Approval (MCoA) being met.

The Department of Environment approved the Residential Subdivision at Gwandalan under sections 130 (1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*, on (EPBC Approval 2012/6382) 29 October 2013, subject to the Conditions of Approval (CoA) being met.

### 1.2 Purpose

This Weed Management Plan (WMP) is a component of the Flora and Fauna Management Plan (FFMP) for the Project at Catherine Hill Bay.

This plan details how to manage weeds in accordance with the requirements of the Conditions of Approval, relevant Authorities and the *Noxious Weeds Act 1993*. This plan applies to weed species known and likely to occur within the Project Area at Catherine Hill Bay. This strategy has been developed in accordance with Condition B10 (2) of the NSW approval and Condition 5(b) of the Commonwealth approval.

### 1.3 Scope

The scope of this Weed Management Plan (WMP) is prescribed within the project approval documentation (Table 1).

**Table 1 Conditions of Approval**

Condition of Approval	Condition Requirements
<b>NSW Department of Planning (10-0204)</b>	
B10 (2)	<i>A Weed Management and Monitoring Plan is to be developed and implemented to minimise the potential for the invasion of aquatic and terrestrial weed species into the SEPP 14 wetlands and buffer zones. The weed management and monitoring plan should be consistent with management</i>

Condition of Approval	Condition Requirements
	<i>strategies undertaken for the adjacent Munmorah SCA and Offset Lands and is to be undertaken by the proponent across the site until 80% of all lots have been developed.</i>
B10 (7)	<i>Management of exotic weeds and pests including infection by <i>Phytophthora cinnamomi</i>, exotic perennial grasses, Bitou, Boneseed, Lantana, exotic vines and scramblers.</i>
<b>Commonwealth Department of Environment (2012/6382)</b>	
5	<i>The person taking the action must submit for approval by the Minister an Environmental Management Plan for each of the two development sites (Catherine Hill Bay and Gwandalan) that provides for the management of ecological values, monitoring and reporting requirements to minimise environmental impacts. The Environmental Management Plan must include as a minimum the following sub-plans:</i>
5 (b)	<i>Weed Management sub-plan. This sub-plan must:</i>  <i>-Include methods and controls for the effective management of <i>Phytophthora cinnamomi</i>.</i>  <i>-Be prepared by a suitably qualified and experienced ecologist.</i>

This plan will include preconstruction, construction and post construction weed control measures. The plan will include measures to be implemented to minimise the potential for the invasion of aquatic and terrestrial weed species, control the spread of weeds, reduce the levels of weed infestation within the Project Area and include measures to improve the quality of habitat in retained vegetation. The plan will particularly detail the management of exotic perennial grasses, Bitou, Boneseed, Lantana, exotic vines and scramblers and infection by *Phytophthora cinnamomi*.

#### 1.4 Relevant Legislation

- Noxious Weeds Act 1993.
- Pesticides Act 1999

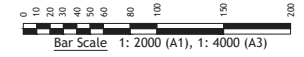
#### 1.5 Relevant References

- *Noxious Weed Declarations for Lake Macquarie LGA* (DPI 2013).
- *Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* (DPI 2011).
- *National Heritage Trust Introductory Weed Management Manual* (CRC for Australian Weed Management, 2004).

#### 1.6 Definitions

- Construction Footprint: As the project is staged, the construction footprint generally comprises one stage at any one time.
- Project: The residential subdivision and development at Catherine Hill Bay.
- Project Area: The 72 hectare footprint in which residential subdivision and development will occur.
- Stage: The Project comprises seven stages, with works commencing in Stage One.

- Threatened Species: A fauna species listed under Schedule 1 of the *Threatened Species Conservation Act 1995* and/or the *Environment Protection and Biodiversity Conservation Act 1999*



SUBSTAGING WITHIN THE EXISTING STAGES IS PERMITTED WITHOUT SEEKING ADDITIONAL APPROVAL.

(F) EASEMENT TO DRAIN WATER 3.05 WIDE (K382897)

- NOTES**
- PROPOSED EASEMENTS FOR SERVICES & DRAINAGE NOT SHOWN & WILL BE SUBJECT TO FINAL DESIGN.

AC	18/09/2012	Remove Pages, Add Heritage Lots
AB	6/08/2012	Drafting Amendments
AA	17/07/2012	Drafting Amendments
Z	14/02/2012	Contours Added
Ver.	Date	Comment



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## 2.0 Weed Species of the Project Area


A total of 59 weed species have been identified in the Project Area (Appendix A), including four weeds of national significance and five declared noxious weeds. The remainder are environmental weeds such as garden escapes, non-indigenous plants or native plants have been recorded as weedy as they are either beyond their natural range, hybridise with indigenous plants or threaten ecological vegetation communities to which they do not belong.

### 2.1 Weeds of National Significance

Weeds of National Significance (WoNS) have been identified by Australian governments based on their invasiveness, potential for spread and environmental, social and economic impacts. Individual landowners and managers are ultimately responsible for managing WoNS. State and territory governments are responsible for overall legislation and administration. Four WoNS have been identified in the Project Area (Table 1).

**Table 2 Weeds of National Significance know to occur in the project site**

Species	Description	Photo
Boneseed <i>(Chrysanthemoides monilifera</i> <i>subspecies rotundata)</i>	A spreading or sprawling shrub with spoon-shaped leaves that are sometimes slightly toothed, with yellow flowers.	
Blackberry <i>(Rubus fruticosus aggregate</i> <i>species)</i>	A semi-deciduous, scrambling shrub with tangled, prickly stems (canes) that form impenetrable thickets several metres high. White or pink flowers 2-3 cm in diameter occur at the end of flowering canes from late November to late February	
Fireweed <i>(Senecio madagascariensis)</i>	A low, heavily branched, annual or short-lived perennial plant that grows from 10 to 60 cm high. Small, yellow and daisy-like, flowers are 1–2 cm in diameter and arranged in clusters at the end of each branch	

Species	Description	Photo
Lantana ( <i>Lantana camara</i> )	An erect or scrambling shrub, growing up to four metres high and often forming dense thickets. Flesh of the plant produces a strong, aromatic odour when crushed. Leaves are rough and bright green on the upper surface and hairy and pale green below. Flowers form in dense clusters and vary in colour from red–yellow, orange–pink, and white.	





## 2.2 Noxious Weeds

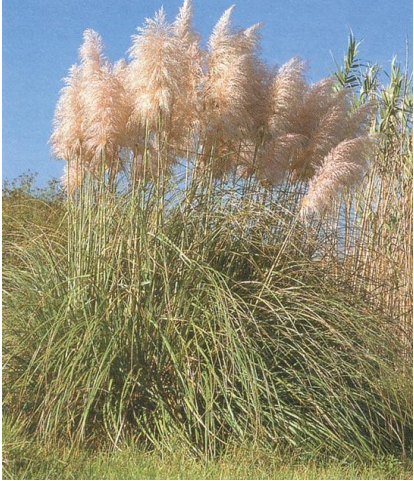
Weeds that are declared noxious are those weeds that have potential to cause harm to the community and individuals, can be controlled by reasonable means and most importantly, have the potential to spread within an area and to other areas. The *Noxious Weeds Act 1993* imposes obligations on occupiers of land to control noxious weeds declared for their area. There are five classes of noxious weeds identified in the Act:

- **Class 1:** Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent. The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
- **Class 2:** Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent. The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
- **Class 3:** plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. Class 3 weeds must be fully and continuously suppressed and destroyed.
- **Class 4:** 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. The growth of Class 4 weeds must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction.
- **Class 5:** plants that are likely to spread within the state. There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

Five noxious weed species have been identified in the Project Area (RPS 2010). Noxious weeds are declared geographically on Local Government Area basis. The Project Area occurs within the Lake Macquarie Local Government Area; noxious weeds declared for this LGA occurring in the Project Area are listed in Table 2.

Table 3 Noxious weeds occurring in the Project Area

Species	Control Class	Description	Photo
Boneseed <i>(Chrysanthemoides monilifera subsp. rotundata)</i>	4	A spreading or sprawling shrub with spoon-shaped leaves that are sometimes slightly toothed, with yellow flowers.	
Blackberry <i>(Rubus fruticosus aggregate species)</i>	4	A semi-deciduous, scrambling shrub with tangled, prickly stems (canes) that form impenetrable thickets several metres high. White or pink flowers 2-3 cm in diameter occur at the end of flowering canes from late November to late February	
Crofton weed <i>(Ageratina adenophora)</i>	4	An erect, shrub with numerous chocolate-brown woody stems and reaching a height of 1–2 m. It has broad, toothed leaves. It produces white flowers in spring.	
Lantana <i>(Lantana species)</i>	4	An erect or scrambling shrub, growing up to four metres high and often forming dense thickets. Flesh of the plant produces a strong, aromatic odour when crushed. Leaves are rough and bright green on the upper surface and hairy and pale green below. Flowers form in dense clusters and vary in colour from red–yellow, orange–pink, and white.	

Species	Control Class	Description	Photo
Pampas grass ( <i>Cortaderia species</i> )	4	A large grass tussock, approximately 1–1.5m across, with large plumed flower heads carried on tall stems.	

### 2.3 Other weed species

Other weed species that occur include garden escapes, non-indigenous plants or native plants that are either beyond their natural range, hybridise with indigenous plants or threaten local vegetation communities. An inventory of weed species identified in the Project Area is provided in Appendix 1.

## 3.0 Plant Pathogen Management

### 3.1 *Phytophthora cinnamomi* (Phytophthora)

Phytophthora is a water mould that attacks the roots of susceptible plants, in many cases killing the plants. The pathogen is known to infect banksias, native peas, eucalypts and ornamentals such as rhododendrons and camellias. In some native plant communities, epidemic disease can develop causing the death of large numbers of plants. *Phytophthora* root rot may spread via the transportation of infected soil or plant material by people, vehicles, tools or animals and may be transported by water percolating through the soil or in creeks. Conclusive identification of *P. cinnamomi* as the cause of disease and plant death requires analysis of soil or root samples in a laboratory.

The extent of the occurrence of *Phytophthora* in NSW is only beginning to emerge, but the pathogen appears to be more widespread than originally thought. It has been identified in the World Heritage areas of northern NSW, including Barrington Tops NP, the Blue Mountains, including Wollemi NP, in southern NSW near Eden and in bushland reserves around Sydney Harbour.

Disease in natural ecosystems of Australia, caused by the introduced plant pathogen *Phytophthora cinnamomi*, is listed as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

### 3.2 Preventing the introduction of Phytophthora

The spread of *Phytophthora* can be minimised by the adoption of management strategies appropriate to the zone and to the proposed activity in that zone. Any activities that involve movement of soil and plant material are high risk for spreading *Phytophthora*.

It is assumed that the Project Area is currently free from Phytophthora. Hygiene protocols to prevent the introduction of this pathogen into the Project Area are described below, and require all footwear, tools and vehicles to be clean prior to entering the construction footprint.

#### 3.2.1 Footwear and small tool washdown

Dirty footwear and equipment can carry infested soil and lead to the spread of Phytophthora. Footwear should be cleaned before entering the site, as outlined below.

- Clean down on formed and impervious surface outside of the construction footprint (ie at entrance to site).
- Remove clumps of soil and plant material with scrub mat and brushes.
- Remove remaining soil & plant material from the scraper, brush and footwear with stiff brushing or compressed air.
- Spray cleaned soles of footwear with 70% methylated spirits (or bleach or the fungicide Phytoclean) to disinfect any remaining material lodged in places difficult to access.

#### 3.2.2 Plant Machinery Washdown

Phytophthora is commonly spread in contaminated soil and water carried on off-road vehicles, machinery and plant. Plant machinery should be certified to be free of foreign soil and plant material before entering the site. Vehicles should be cleaned before entering the site, as outlined below.

- Use hardstand area or public car wash to clean vehicle.
- Remove all soil and organic material with a high pressure hose, garden hose or with brushes. Inspect the following areas:

- 
- » Body – Chassis, Inside, Underneath, Bumper Bars, Crevices, Mud Flaps;
  - » Tyres – Inside Hub, Outside, Between Dual Wheels, Spare Wheel;
  - » Cabin– Floor, Mats;
  - » Engine – Radiator, Engine Bay & Grill; and
  - » Tray– inside and outside.
  - » Associated implements eg excavator buckets.
- Ensure that effluent is contained and not allowed to spread off site. Avoid driving through removed soil/mud after cleaning down. Do not pick up any infested material from the effluent when leaving the washdown site.
  - In addition to cleaning the car with water, a range of disinfectants may be used. For example, add 'fungicide' such as Phytoclean® or Coolacide® to water at label-recommended rates. Alternatively, 70% methylated spirits may be used.

### 3.2.3 Other considerations

- Travel only on designated roads and tracks. Avoid entering surrounding bushland.
- Disturb the soil as little as possible when controlling pests and pest plants.
- Ensure water and effluent does not drain towards vegetation. Avoid sites prone to flooding and ponding.
- Erect signs as appropriate, e.g. at vehicle washdown bay.
- Educate contractors as to the importance of *Phytophthora* and their role in preventing its spread.
- Avoid working in wet conditions.

## 4.0 Weed Management

Weed management within the Project Area will consist of the staged removal of all vegetative cover from the Project Area (including weeds) and ongoing monitoring and maintenance to ensure effective control of any new weed infestation that occurs.

### 4.1 Methods of Removal

#### 4.1.1 Mechanical

Mechanical removal of weeds will be undertaken where weeds occur within the construction footprint.

Mechanical techniques include:

- Excavators or bulldozers to be used to remove larger trees and root systems. Stumps are to be ground out of the soil.
- Slashers or bulldozers to be used to remove shrubby weeds.
- Seedlings or regrowth of weed species can be slashed.

#### 4.1.2 Chemical Treatment of weeds

Chemical treatment will also be the main treatment method to be used to treat weeds following clearing operations. Chemical treatment is to be used for the treatment of general annual and perennial weeds or young trees; and for regrowth of tree species. Herbicide application is to be administered by authorised personnel, with ChemCert Accreditation AQF 3 (in accordance with Workcover requirements).

##### 4.1.2.1 [Herbicide application](#)

Noxious and environmental weeds are to be treated in accordance with the herbicide specific to each species, as listed in the *Noxious and Environmental Weed Control Handbook* (DPI 2011). These treatments are listed in Appendix 2. Although in the tables trade names are used, in most cases there are other products with the same active constituents and quantities. Any product with the same active constituents may be used.

Herbicides are not to be sprayed:

- In wind speeds of 10km/h or greater, causing spray to drift into non-target areas.
- On hot days when plants are stressed.
- After weeds seeds have set.
- Within 24 hours of imminent rain.
- In proximity to threatened flora species, as the spray can drift onto the threatened species. In this case, undertake cut-stump or stem injection methods of weed control.
- Where they will detrimentally affect water quality, or so close to a watercourse that the herbicide can enter the water and contaminate the waterway. Only pesticides registered for use near water may be used near water.

Within 24 hours of applying the herbicide, a Herbicide Application Record Sheet must be completed (Appendix 3). A copy must be submitted to the Environmental Manager and development Certifier.

A record sheet is not required where herbicide is applied by hand or using hand-held equipment, or, if applied in quantities of no more than 5 litres/5 kilograms of concentrated product or 20 litres/20 kilograms of the ready-to-use product.

## 4.2 Prevention of importation of weeds

To control the import of weeds into the Project Area from external sources, the Environmental Manager must be diligent in ensuring that plant and equipment is certified as free of weeds prior to being brought to the Project Area. The Plant Manager and will implement the following procedure for all new plant and equipment brought to the Project Area during construction:

- All site personnel are to be inducted on the existence of noxious weeds in the Project Area during the Project induction and as required in toolbox talks and the controls they are required to implement to minimise weed spread.
- All construction machinery used within the Project Area to remove weeds is to be thoroughly cleaned by removing all plant material and soil (potentially containing weed seeds and propagules).
- Equipment used for treating weed infestation will be cleaned prior to moving to a new area within the Project Area to minimise the likelihood of transferring any plant material and soil.



## 5.0 Ongoing Weed Management

### 5.1 Management Actions

Given the disturbed nature of the Project Area that will result from staged construction activities, ongoing weed management will be required to control weed infestations.

In accordance with the *Munmorah Stare Conservation Area Plan of Management* (NPWS 2005), priority for weed control will be given to those declared noxious in Wyong LGA (generally the same noxious weeds as listed for Lake Macquarie LGA); to weeds of national significance; to key threatening processes; and to weed infestations in significant vegetation communities. Other environmental weeds will be progressively controlled, and where practicable removed.

Weed infestations that are identified are to be managed in accordance with the removal methods outlined in Section 3. Verification of proposed control measures and supervision of weed control activities is to be undertaken in consultation with a qualified weed contractor, which may include:

- Herbicide treatment, in accordance with chemicals specific to noxious weeds species as listed in Appendix 2.
- Minimal impact/disturbance methods: removal of weeds by hand or low disturbance mechanical means should be used (i.e. dug out with a mattock or cut and paint technique).

Activities must be reported to the Environmental Manager.

### 5.2 Revegetation of Project Area

Upon the completion of successful treatment, areas of bare/exposed soil are to be stabilised and in accordance with the site landscaping plans.

### 5.3 Weed Monitoring

Weed monitoring will evaluate the effectiveness of weed management across the Project Area. Monitoring actions will include regular site visits, mapping and fixed point photographs and will be implemented on a stage-by-stage basis.

Monitoring inspections are to be undertaken on a monthly basis for the first 6 months after commencement of construction in a stage, then every 2 months until the completion of the stage.

A report is to be submitted to the Environmental Manager and development Certifier outlining the results of each monitoring inspection.

## 6.0 References

- Australian Weeds Committee (2013). *Weeds of National Significance*. Website:  
<http://www.weeds.org.au/WoNS/>
- Botanic Gardens Trust (2013). *PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia* (Version 2). <http://plantnet.rbgsyd.nsw.gov.au>.
- DPI (2013) *Noxious Weed Declarations*. Department of Primary Industries-Fishing and Aquaculture.  
Website: <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed>
- Keith D A (1994). *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*. NSW Dept of Environment and Conservation.
- NPWS (2005). *Munmorah State Conservation Area and Bird Island Nature Reserve, Plan of Management*. Department of Environment and Conservation. NSW.
- NSW DII (2009). *Weeds*. New South Wales Department of Industry and Investment. Website:  
<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds>
- Richardson FJ., Richardson RG. And Shepherd RCH. (2007) *Weeds of the South-East: An Identification Guide for Australia*. R.G. and F.J Richardson, Victoria.
- RPS (2007a) *Ecological Constraints Investigations Phase 1, Over Various Land Holdings in the Lower Hunter/Central Coast NSW*. A report prepared for Coal & Allied.
- RPS (2007b) *Ecological Assessment Report for Southern Lands at Catherine Hill Bay*. A report prepared for Coal & Allied (November 2007).
- RPS (2010a) *Ecological Assessment Report: Southern Lake Macquarie Lands*. Report prepared for Rose Group Pty Ltd , September 2010. RPS, Newcastle.
- RPS (2010b). *Ecological Assessment Report – Lower Hunter Lands, Gwandalan*. Report prepared for Coal and Allied Industries Ltd, November 2010. RPS, Newcastle.
- Wildthing Environmental Consultants (2003a) *Statement of Effect on Threatened Flora and Fauna for the proposed development of Part Lot 6 DP 774923, Catherine Hill Bay, NSW, December 2003*, Coastal Hamlets Pty Ltd.
- Wildthing Environmental Consultants (2003b) *Ecological Constraints Study for Lot 3 DP 588206, Kanangara Drive, Gwandalan, NSW, October 2003*, Lakeside Living Pty Ltd.
- Wildthing Environmental Consultants (2004a) *Statement of Effect on Threatened Flora and Fauna for the proposed development of Part Lot 2 DP 809795, Catherine Hill Bay, NSW, February 2004*, Coastal Hamlets Pty Ltd.

Wildthing Environmental Consultants (2004b) *Statement of Effect on Threatened Flora and Fauna for the proposed development of Part Lot 2031 DP 841175, Catherine Hill Bay, NSW, February 2004*, Coastal Hamlets Pty Ltd.

Wildthing Environmental Consultants (2004c) *Statement of Effect on Threatened Flora and Fauna for the proposed development of Part Lot 5 DP 774923 and Part Lot 2031 DP 841175, Catherine Hill Bay, NSW, July 2004*, Coastal Hamlets Pty Ltd.

# Appendix 1

## Weed Species Inventory

## Weed species previously recorded in the Project Area

Scientific Name	Common Name
<i>Ageratina adenophora</i>	Crofton Weed
<i>Anagallis arvensis</i>	Scarlet Pimpernel
<i>Anagallis arvensis</i> var. <i>caerulea</i>	Blue Pimpernel
<i>Andropogon virginicus</i>	Whisky Grass
<i>Aster subulatus</i>	Wild Aster
<i>Atriplex hastata</i>	Orache
<i>Axonopus affinis</i>	Narrowleaf Carpet Grass
<i>Bidens pilosa</i>	Cobbler's Pegs
<i>Briza maxima</i>	Quaking Grass
<i>Briza minor</i>	Shivery Grass
<i>Bromus cartharticus</i>	Prairie Grass
<i>Centaureum tenuiflorum</i>	Common Centaury
<i>Cerastium holosteoides</i>	Mouse-ear Chickweed
<i>Chloris gayana</i>	Rhodes Grass
<i>Chrysanthemoides monilifera</i> ssp. <i>rotundata</i>	Bitou Bush
<i>Cyclosporum leptophyllum</i>	Slender Celery
<i>Cinnamomum camphora</i>	Camphor Laurel
<i>Cirsium vulgare</i>	Spear Thistle
<i>Conyza albida</i>	Tall Fleabane
<i>Conyza bonariensis</i>	Flaxleaf Fleabane

Scientific Name	Common Name
<i>Cortaderia selloana</i>	Pampas Grass
<i>Ehrharta erecta</i>	Panic Veldtgrass
<i>Eragrostis tenuifolia</i>	Elastic Grass
<i>Gnaphalium americanum</i>	Cudweed
<i>Gnaphalium sphaericatum</i>	Cudweed
<i>Gomphocarpus fruticosus</i>	Narrow-leaf Cotton Bush
<i>Hydrocotyle bonariensis</i>	Kurnell Curse
<i>Hyparrhenia hirta</i>	Coolatai Grass
<i>Hypochaeris radicata</i>	Cat's Ear
<i>Ipomoea cairica</i>	Coastal Morning Glory
<i>Lantana camara</i>	Lantana
<i>Ligustrum sinense</i>	Small-leaved Privet
<i>Liquidambar formosana</i>	Chinese Liquidambar
<i>Modiola caroliniana</i>	Red-flowered Mallow
<i>Ochna serrulata</i>	Ochna
<i>Oxalis corniculata</i>	Yellow Wood Sorrel
<i>Oxalis latifolia</i>	Pink Shamrock
<i>Paspalum urvillei</i>	Vasey Grass
<i>Paspalum dilatatum</i>	Paspalum
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Pinus radiata</i>	Radiata Pine

Scientific Name	Common Name
<i>Plantago lanceolata</i>	Lamb's Tongues
<i>Protasparagus aethiopicus</i>	Asparagus Fern
<i>Richardia brasiliensis</i>	Mexican Clover
<i>Rubus ulmifolius</i>	Blackberry
<i>Senecio madagascariensis</i>	Fireweed
<i>Sida rhombifolia</i>	Paddy's Lucerne
<i>Solanum mauritianum</i>	Wild Tobacco
<i>Soliva sessilis</i>	Bindi
<i>Sporobolus africanus</i>	Parramatta Grass
<i>Sporobolus elongatus</i>	Slender Rat's-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Trifolium dubium</i>	Yellow Suckling Clover
<i>Trifolium repens</i>	White Clover
<i>Verbena bonariensis</i>	Purple-Top
<i>Vicia sativa</i>	Common Vetch
<i>Hypericum gramineum</i>	St Johns Wort

## Appendix 2

### Chemical Treatment for Weeds



**Asparagus fern (*Asparagus aethiopicus*)**

Chemical and concentration	Rate	Comments
<b>Glyphosate</b> 360 g/L Various trade names	1 part glyphosate to 50 parts water 1 part glyphosate to 1.5 parts water	Spot spray application, best done between flowering and berries forming. Cut stump/scrape stem. Gouge rhizome and paint.
<b>Metsulfuron-methyl</b> 600 g/kg Various trade names	1–2 g/10 L water plus non-ionic surfactant (01.% or 1 mL/L)	Spot spray application, best done between flowering and berries forming.

Bitou bush (*Chrysanthemoides monilifera* ssp. *Rotundata*)

Chemical and concentration	Rate	Comments
<b>Glyphosate</b> 360 g/L Various trade names	5 or 10 mL per 1 L of water	Handgun or knapsack. Spray to wet all foliage. Apply at peak flowering to actively growing bushes during winter. Do not apply during periods of drought stress. Use the higher rate for plants over 1.5 m.
<b>Glyphosate 360 g/L</b> Various trade names <b>Metsulfuron-methyl</b> 600g/L Various trade names	2 L /ha 20–30g /ha	Aerial boom spray applications Refer to the critical use comments in the permit.
<b>Metsulfuron-methyl</b> 600 g/L Various trade names	10 g per 100 L of water	Spray to wet all foliage thoroughly.
<b>Metsulfuron-methyl + glyphosate</b> 63.2 g/kg + 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Spray to wet all foliage thoroughly.
<b>2,4-D + picloram</b> 300 g/L + 75 g/L Various trade names	650 mL per 100 L of water	Spray to wet all foliage thoroughly. Treat at flowering to fruiting stage.
<b>Picloram</b> 45 g/kg Vigilant®	Undiluted	Cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm (see label).

Blackberry (*Rubus fruticosus aggregate*)

Chemical and concentration	Rate	Comments
<b>Triclopyr</b> 200 g/L + <b>picloram</b> 100 g/L Tordon® DSH	500 mL per 100 L of water	Late spring to autumn treatment. Use an adjuvant.
<b>Glyphosate</b> 360 g/L Various trade names	10–13 mL per 1 L of water	Flowering to leaf fall. Use higher rate on old, dense infestations.
<b>Glyphosate</b> 835 g/kg + <b>metsulfuron-methyl</b> 10 g/kg Trounce®	1 measured pack (173 g) per 100 L of water	Apply from flowering until before leaf yellowing. Do not apply to bushes with mature fruit.
<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>glyphosate</b> 760.5 g/kg Cut-out®	1 measured pack (95 g) per 100 L of water	Apply between January and April when bushes are actively growing. Do not apply to bushes with mature fruit.
<b>Metsulfuron-methyl</b> 600 g/kg Various trade names	10 g per 100 L of water	Apply when bushes are actively growing. Thoroughly wet all foliage and canes at commencement of flowering.
<b>Hexazinone</b> 250 g/L Velpar L® and various trade names	Undiluted (4 mL per spot)	Bushes up to 1 m in height.
<b>Picloram</b> 20 g/kg Tordon® Granules	35–45 g /m <sup>2</sup>	Apply granules over an area extending from main stem to 30 cm outside the drip line.
<b>Triclopyr</b> 600 g/L Various trade names	170 mL per 100 L of water	Late spring to early autumn. Actively growing bushes. Do not use under dry conditions.
<b>Triclopyr</b> 300 g/L + <b>picloram</b> 100 g/L Various trade names	350 or 500 mL per 100 L of water	Late spring to early autumn when bushes are actively growing. Use the higher rate on plants which have been damaged by grazing stock or insects.
<b>Picloram</b> 45 g/kg Vigilant®	Undiluted	Cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm (see label).
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300g/L + <b>Aminopyralid</b> 8 g/L Grazon® Extra	350 or 500 mL per 100 L water	Treat in late spring to autumn. Use an adjuvant.

**Coolatai Grass (*Hyparrhenia hirta*)**

Chemical and concentration	Rate	Comments
<b>Glyphosate</b> 360 g/ L Various trade names <b>Flupropanate</b> 745g/L Various trade names	200 mL glyphosate in 10 L of water 200 mL glyphosate plus 20 mL flupropanate per 10 L of water	Spot spray application. Can be used 2–3 times from September to May. Spot spray application between July and October. Only use the tank mix once per season.
<b>Flupropanate</b> 745 g/L Tussock®	300 mL per 100 L water	Apply in winter and spring between July and October.
<b>Glyphosate</b> 360 g/ L Various trade names <b>Flupropanate</b> 745g/L Various trade names	200 mL glyphosate in 10 L of water 200 mL glyphosate plus 20 mL flupropanate per 10 L of water	Spot spray application. Can be used 2–3 times from September to May. Spot spray application between July and October. Only use the tank mix once per season.

**Crofton Weed (*Ageratina adenophora*)**

<b>Chemical and concentration</b>	<b>Rate</b>	<b>Comments</b>
<b>Triclopyr 300 g/L + picloram 100 g/L + Aminopyralid 8 g/L</b> Grazon Extra ®	350 mL in 100 L of water	Spring to autumn. Spray all foliage to point of run-off. Actively growing plants.
<b>Triclopyr 300 g/L + picloram 100 g/L</b> Various trade names	350 mL per 100 L of water	Spring to autumn. Spray all foliage to point of run-off. Actively growing plants.
<b>Fluroxypyr 333 g/L</b> Starane Advanced ®	300 ml in 100 L of water	Apply to actively growing seedlings and young plants up to flowering.
<b>Fluroxypyr 200 g/L</b> Various trade names	500 mL per 100 L of water	Apply to actively growing seedlings and young plants up to flowering.
<b>Fluroxypyr 140 g/L + Aminopyralid 10 g/L</b> Hot shot ®	700 mL in 100 L of water 1.5 L/ha	Apply to actively growing plants from October to April
<b>MCPA 340 g/L + Dicamba 80 g/L</b> Various trade names	190–270 mL per 100 L of water 2.8–4.0 L/ha	Spray during active growth. For use in grass pastures.
<b>2,4-D 300 g/L + picloram 75 g/L</b> Tordon® 75-D	650 mL per 100 L of water	For use in grass pasture when weed is actively growing.
<b>Glyphosate 360 g/L</b> Various trade names	500 mL per 100 L of water	Actively growing plants with full foliage.
<b>Metsulfuron-methyl 600 g/kg</b> Various trade names	15 g per 100 L of water	Add surfactant. Thoroughly wet all foliage to

Camphor laurel (*Cinnamomum camphora*)

Chemical and concentration	Rate	Comments
<b>Picloram</b> 100 g/L + <b>Triclopyr</b> 300g/L + <b>Aminopyralid</b> 8 g/L Grazon® Extra	350 or 500 mL per 100 L water	Use higher rate on trees over 2 m tall. Apply as a thorough foliar spray.
<b>Triclopyr</b> 300 g/L + <b>picloram</b> 100 g/L Various trade names	350–500 mL per 100 L of water	Use higher rate on trees over 2 metres tall. Apply as a thorough foliage spray.
<b>Triclopyr</b> 240 g/L + <b>picloram</b> 120 g/L Access®	1 L per 60 L of diesel	Basal bark application for basal diameter less than 10 cm or cut stump application for greater than 10 cm.
<b>Triclopyr</b> 200 g/L + <b>picloram</b> 100 g/L Tordon® DSH	1 part per 4 parts water (1–2 mL per cut)	Stem injection application.
<b>Triclopyr</b> 600g/L Various trade names	170 mL per 100 L of water 1 L per 60 L of diesel	Seedling to three metres tall. Basal bark or cut stump application.
<b>Glyphosate</b> 360 g/L Various trade names	1 part glyphosate to 1 part water, 2 mL per cut Undiluted, 2 mL per cut.	Stem injection for basal diameter up to 25 cm. Stem injection for basal diameter 25 cm to 60 cm.
<b>Picloram</b> 45 g/kg Vigilant®	Undiluted	Cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm.
<b>Glyphosate</b> 360 g/L Various trade names	1 part glyphosate to 50 parts water 1 part glyphosate to 1.5 parts water	Spray seedlings and coppice shoots. Cut stump/scrape stem application for saplings. Stem injection application large trees and shrubs.
<b>Glyphosate</b> 360 g/L Various trade names	Undiluted	4ml per drill hole / axe cut.

Lantana ( <i>Lantana camara</i> )		
Chemical and concentration	Rate	Comments
<b>Triclopyr 300 g/L + picloram 100 g/L + Aminopyralid 8 g/L</b> Grazon Extra®	350 mL or 500 mL in 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
<b>Triclopyr 300 g/L + picloram 100 g/L</b> Various trade names	350 or 500 mL per 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
<b>Fluroxypyr 333 g/L</b> Starane Advanced®	300 mL or 600 in 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
<b>Fluroxypyr 200 g/L</b> Various trade names	500 mL or 1.0 L per 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
<b>Fluroxypyr 140 g/L + aminopyralid 10 g/L</b> Hotshot®	500 mL per 100 L of water 700 mL per 100 L of water	Seedlings and regrowth 0.5–1.2 m height. Mature plants and regrowth 1.2–2.0 m. Apply to actively growing plants.
<b>Triclopyr 240 g/L + picloram 120 g/L</b> Access®	1.0 L per 60 L of diesel	Basal bark or cut stump application.
<b>Glyphosate 835 g/kg + metsulfuron-methyl 10 g/kg</b> Trounce®	1 measured pack (173 g) per 100 L of water	Apply when actively growing, thoroughly wet all
<b>Metsulfuron-methyl 63.2 g/kg + glyphosate 760.5 g/kg</b> Cutout®	1 measured pack (95 g) per 100 L of water	Apply when actively growing, thoroughly wet all foliage and stems. Do not apply during stress periods.
<b>Glyphosate 360 g/L</b> Various trade names	1.0 L per 100 L of water	Actively growing with full foliage. Avoid summer stress.
<b>2,4-D 300 g/L + picloram 75 g/L</b> Tordon® 75-D	650 mL per 100 L of water	High volume spot spray. Thoroughly wet foliage and soil around the base of plant during March to May.
<b>Dichlorprop 600 g/L</b> DP600®	1.0 L per 200 L of water	Spot spray application, completely wet all leaves and stems.
<b>Triclopyr 600 g/L</b> Various trade names	1.0 L per 60 L of diesel	Basal bark application for basal diameter less than 5 cm or cut stump application above 5 cm.
<b>Metsulfuron-methyl 600 g/kg</b> Brushoff®	10 g metsulfuron-methyl plus 200 mL glyphosate per 100 L of water	Apply to bushes up to 2 m high. Thoroughly wet all foliage and stems. Add organosilicone

**Lantana (*Lantana camara*)**

		penetrant.
<b>Glyphosate</b> 360 g/L Various trade names	10 g metsulfuron-methyl plus 200 mL glyphosate per 100 L of water	Apply to bushes up to 2 m high. Thoroughly wet all foliage and stems. Add organosilicone penetrant.
<b>Metsulfuron-methyl</b> 600 g/kg Various trade names	10 g per 100 L of water	Apply to bushes up to two metres tall. Spray to wet all foliage and stems. Re-treatment will be necessary.
<b>2,4-D Amine</b> 625 g/L Various trades names	320 mL in a 100 L of water	Apply to actively growing bushes.
<b>Picloram</b> 45 g/kg Vigilant®	Undiluted	Cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply



**Pampas Grass (*Cortaderia sp.*)**

<b>Chemical and concentration</b>	<b>Rate</b>	<b>Comments</b>
<b>Glyphosate</b> 360 g/L Various trade names	1.0 or 1.3 L per 100 L of water	Actively growing plants, before flowering, spring to autumn. Use higher rate on plants over 1 m high.

<b>Privet (<i>Ligustrum</i> sp.)</b>		
<b>Chemical and concentration</b>	<b>Rate</b>	<b>Comments</b>
<b>Metsulfuron-methyl</b> 600 g/kg Various trade names	10 g per 100 L of water	Apply to bushes up to 3 m high; complete coverage is essential.
<b>Metsulfuron-methyl</b> 63.2 g/kg + <b>glyphosate</b> 760.5 g/kg <b>Cut-out®</b>	1 measured pack (95 g) per 100 L of water	Apply to bushes up to 3 m high, in full leaf and actively growing; complete coverage is essential.
<b>Triclopyr</b> 600 g/L Various trade names	1.0 L per 12 L of diesel	Basal bark/cut stump application.
<b>Triclopyr</b> 240 g/L + <b>picloram</b> 120 g/L <b>Access®</b>	1.0 L per 30 L of diesel	Basal bark/cut stump application.
<b>Glyphosate</b> 360 g/L Various trade names	Undiluted (1–2 mL per cut)	Stem injection technique, as per label.
<b>Picloram</b> 45 g/kg <b>Vigilant®</b>	Undiluted	Cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm (see label).

**St John's Wort (*Hypericum gramineum*)**

Chemical and concentration	Rate	Comments
<b>Triclopyr + picloram</b> 300 g/L + 100 g/L + <b>Aminopyralid</b> 8 g/L Grazon Extra ®	500 mL in 100 L of water 2.0–4.0 L/ha	Foliar application from late spring to early summer, during flowering to early seed set Boom spray
<b>Triclopyr + picloram</b> 600 g/L Various trade names	500 mL in 100 L of water 2.0–4.0 L/ha	Late spring to early summer, during flowering to early seed set. Boom spray.
<b>Fluroxypyr</b> 333 g/L Starane Advanced ®	300 mL in 100 L of water	Foliar application from flowering to early seed set. Observe withholding period.
<b>Fluroxypyr</b> 200 g/L Various trade names	500 mL in 100 L of water 3.0 L/ha	Spring to mid-summer application. Boom application. Observe withholding period.
<b>Aminopyralid</b> 10 g/L + <b>fluroxypyr</b> 140 g/L Hotshot ®	700 mL in 100 L of water	Foliar application from flowering to early seed set
<b>Glyphosate</b> 360 g/L Various trade names	3.0 L/ha	Apply November to May, flowering to post-flowering.
<b>2,4-D ester</b> 600 g/L Various trade names and formulations	3.7–5.3 L/ha	For use in grass pastures, before flowering, when the plants are less than 40 cm high.
<b>Glyphosate + metsulfuron-methyl</b> 835 g/kg + 10 g/kg Trounce®	1 measured pack (173 g) in 100 L of water	Actively growing from spring to summer.
<b>Glyphosate</b> 360 g/L Various trade names <b>Metsulfuron-methyl</b> 600 g/L Various trade names	200 mL glyphosate plus 10 g metsulfuron-methyl in 100 L of water	Spray to wet, but not to cause run-off.

## Appendix 3

### Herbicide Application Sheet

Herbicide Application Record Sheet	Comment
Date	
Time	
Name of Operator ( include address and phone number)	
Name of landowner on which herbicide was applied (include address and phone name)	
List of areas treated, in order of treatment	
Describe the weed treated (e.g. controlling of spot weed infestation-lantana)	
Product used (include full name and/or product code)	
Equipment used to apply herbicide (e.g. backpack sprayer)	
Quantity applied and dilution (include whether mix was concentrated or if diluted, the rate of dilution)	
Size of area treated (square metres or hectares)	
Wind speed and direction	
Other weather details (e.g. temperature, humidity, rainfall)	