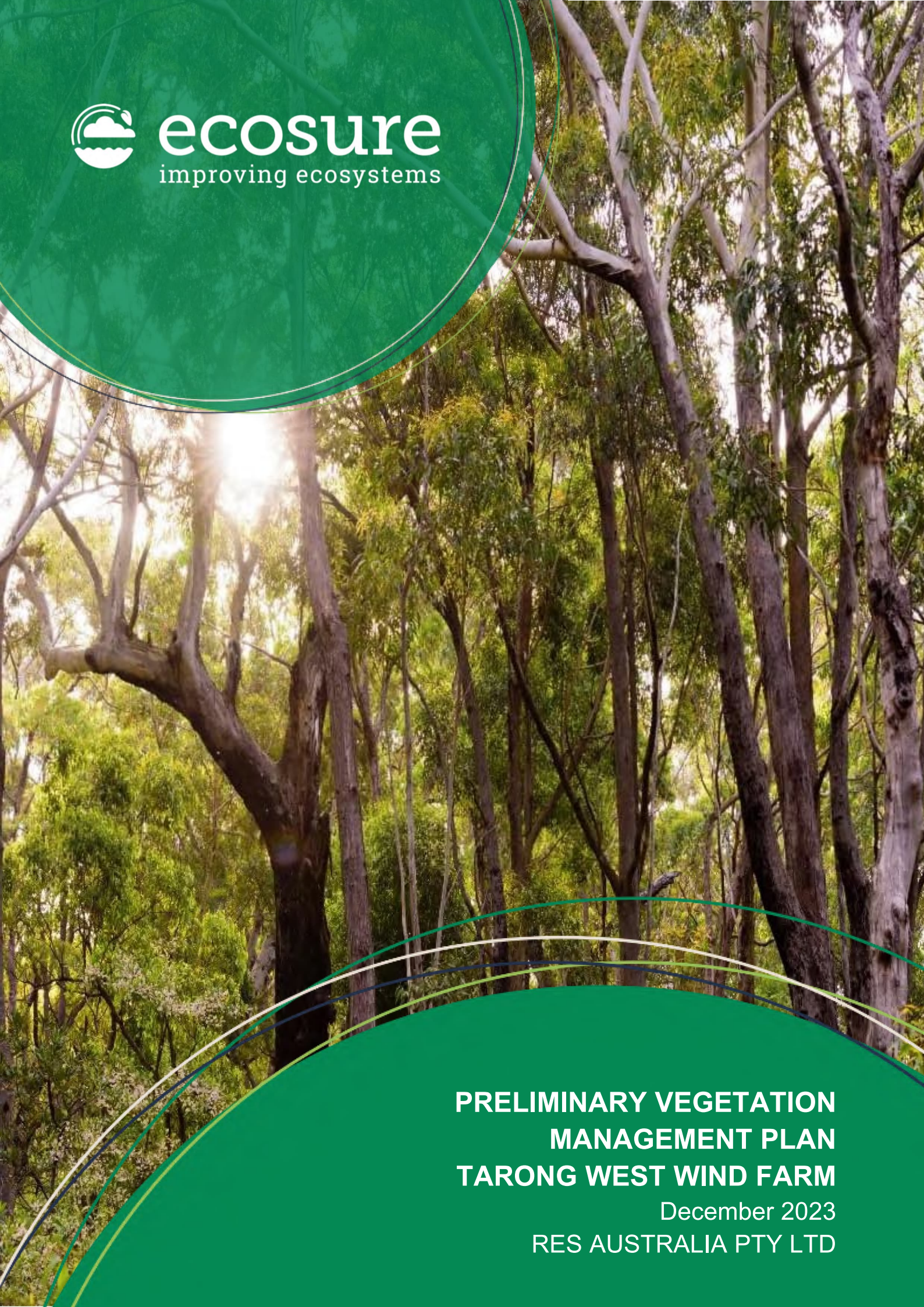
Appendix M

Preliminary Vegetation Management Plan



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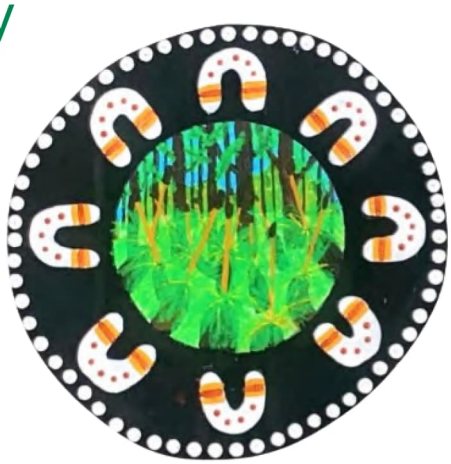
PRELIMINARY VEGETATION MANAGEMENT PLAN TARONG WEST WIND FARM

December 2023

RES AUSTRALIA PTY LTD

Acknowledgement of Country



Ecosure acknowledge the Traditional Custodians of the lands and waters where we work. We pay deep respect to Elders past and present who hold the Songlines and Dreaming of this Country. We honour and support the continuation of educational, cultural and spiritual customs of First Nations peoples.

Acknowledgements

Ecosure would like to acknowledge the project team that has collaboratively contributed knowledge over the course of the project to produce this Vegetation Management Plan, including staff from icubed Consulting Pty Ltd, AECOM Australia Pty Ltd and RES Australia Pty Ltd.

Glossary, acronyms and abbreviations

BoM	Bureau of Meteorology
Conservation significant species	Species listed as threatened (critically endangered, endangered, vulnerable) and/or migratory under EPBC Act; or threatened (critically endangered, endangered, vulnerable), near threatened or special least concern (fauna) under NC Act
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy the Environment and Water
DES	Department of Environment and Science (Queensland)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
HVR	High value regrowth
MNES	Matters of national environmental significance
MSES	Matters of state environmental significance
NC Act	*Nature Conservation Act 1992* (Queensland)
RE	Regional ecosystem
SARA	State Assessment Referral Agency
SLC	Special least concern
SEVT	Semi-evergreen vine thicket
TEC	Threatened ecological community
TPZ	Tree protection zone
VM Act	*Vegetation Management Act 1999* (Queensland)
VMP	Vegetation management plan
WoNS	Weed of national significance
WTG	Wind turbine generator

Contents

List of figures

List of tables

1 Introduction

1.1 Background

This preliminary Vegetation Management Plan (VMP) has been produced for RES Australia Pty Ltd (RES) to support a development application for the proposed Tarong West Wind Farm site (herein referred to as the project site). This VMP addresses the requirements of the State Development Assessment Provisions version 3.0 and Performance Outcome 5 of State Code 23: Wind farm development, as they relate to flora.

The intention of this VMP is to provide avoidance, minimisation, and mitigation measures to protect flora from adverse impacts resulting from the proposed development. The VMP incorporates information identified from desktop and field assessments (Ecosure 2023a, 2023b). This information includes an assessment of onsite habitat values, records of vegetation present or likely to occur within the project site, potential impacts to vegetation and strategies to mitigate vegetation impacts.

1.2 Proposed development

The proposed development is the construction and operation of a wind farm located at Ironpot, near Kingaroy in south east Queensland (Figure 1). The wind farm will have up to 97 wind turbine generators (WTG) connected by access tracks and supported by other infrastructure. The development and construction of the site will involve significant ground disturbing work and will include the construction of the following key components:

- up to 97 WTGs
- wind turbine foundations and hardstand areas (approximately 270 m by 110 m, plus a 30 m buffer around the perimeter, to allow construction and crane placement)
- three permanent and four temporary (during construction period only) meteorological masts
- internal electrical reticulation consisting of overhead lines (OHL) and underground (UG) cabling
- access tracks including widening sections of Ironpot Road
- planning corridor containing a maximum clearing footprint of 1,062.14 ha. The planning corridor allows scope to micro-site project infrastructure within the planning corridor, with the disturbance capped at the area of the clearing footprint
- on-site connection to existing 275 kilovolt (kV) transmission line
- electrical substations to facilitate connection of the project to the grid
- one battery energy storage system
- construction compounds and laydown areas
- site compounds

- operations and maintenance facilities
- batching plant
- borrow pits
- washdown areas.

Figure 2 shows the proposed planning corridor and clearing footprint to accommodate WTGs, access tracks and other associated infrastructure. The clearing footprint represents the maximum proposed clearing area (as provided on July 2023) and may be reduced by ongoing refinement in the design and micro-siting of infrastructure throughout the development phase of the project. In the planning corridor presented in this preliminary plan, no WTGs or hardstands are proposed to be placed in ecologically significant areas (e.g. areas of remnant vegetation).

The project is currently planned to be constructed in a single stage, however the development may be constructed in multiple stages. Construction is proposed to start in the third quarter of 2024 and last approximately 30 months.

Construction

The construction methodology will generally include:

- marking out areas for infrastructure installation
- clearing the areas of vegetation
- scraping off the topsoil and stockpiling for later use in rehabilitation
- construction of access tracks
- widening sections of Ironpot Road to allow transport of WTGs
- creating a level pad for infrastructure construction
- installing the infrastructure
- rehabilitating disturbed surfaces that are not required for operations.

Operation

The project is expected to have an operational life of at least 30 years excluding construction and decommissioning. The operational parameters of the project have not been finalised at this stage. However, it has been assumed that all WTGs will be operating continuously when wind speeds are sufficient, apart from occasional shut-down periods for maintenance.

Decommissioning

Decommissioning or repowering of the site is expected to occur at the end of the project's useful life. The decommissioning methodology has not been finalised at this stage.

1.3 Aim and Objectives

The aim of this VMP is to avoid, minimise and mitigate potential impacts to vegetation during construction and operation of the project.

The objectives of the VMP to support this aim include:

- clearing works are conducted to ensure that impacts to retained vegetation and sensitive environmental areas are avoided
- the ecological values of retained vegetation and other ecological values (e.g. watercourses, habitats) are not compromised by clearing works, gross mechanical disturbance or impacts associated with sedimentation and/or pollutant export from the construction area
- vegetation clearing works avoids harm to wildlife, as far as practicable.

1.4 Document context

The Preliminary VMP is supported by, and should be read in conjunction with, the following documents:

- Ecological Assessment Report for Tarong West Wind Farm (Ecosure 2023a)
- Tarong West Wind Farm Transport Route Ecological assessment (Ecosure 2023b)
- Preliminary Bird and Bat Management Plan for Tarong West Wind Farm (Ecosure 2023c)
- Preliminary Fauna Management Plan for Tarong West Wind Farm (Ecosure 2023d).

1.5 Report conventions

The following conventions are used throughout the report:

- The project site comprises the properties identified in Figure 1.
- The project boundary defines the outer perimeter of the project site.
- The proposed development comprises the spatial data presented in the shapefiles provided by RES in July 2023.
- The planning corridor is the area containing all infrastructure and development to occur within the project site and includes the clearing footprint (Figure 2).
- The clearing footprint represents the maximum disturbance footprint of the project. While the clearing footprint in the preliminary VMP includes the entire planning corridor, the final clearing footprint is expected to be reduced via micro-siting of infrastructure within the planning corridor.
- Conservation significant species include species that are listed as:

  - threatened (critically endangered, endangered or vulnerable) and/or migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  - threatened (critically endangered, endangered or vulnerable) or near threatened flora and fauna species and special least concern (SLC) fauna species under the *Nature Conservation Act 1992* (NC Act).

- Common and scientific names of flora species follow the Department of Environment and Science (DES) WildNet database (DES 2023).
- Introduced species are denoted by an asterisk (*).

1.6 Legislative content

Table 1 outlines statutory legislation that is relevant to:

- identifying the flora values likely to be present on the site
- providing guidance for the assessment of potential project impacts
- avoiding, minimising and mitigating impacts of project activities.

Table 1 Statutory legislation applicable to the VMP

Jurisdiction	Legislation / Guideline	Brief description
Commonwealth	EPBC Act Significant Impact Guidelines 1.1 - Matters of National Environmental Significance	The EPBC Act provides the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places identified as matters of national environmental significance (MNES). MNES are defined in the EPBC Act and include: · Ramsar wetlands of international importance · World Heritage properties · National Heritage places · Commonwealth Marine areas · the Great Barrier Reef Marine Park · nationally listed threatened species and ecological communities · nationally listed migratory species · nuclear actions (including uranium mining) · water resources in relation to coal seam gas and large coal mining development. A project or action which is likely to have a significant impact on a MNES is a 'controlled action' and must be submitted to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment and determination by the Minister. The EPBC Act processes allow voluntary referral of a project to seek confirmation as to whether a significant impact on MNES is likely and to confirm any approval pathway. The Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DoE 2013) were released to assist proponents with the assessment of the significance of impacts on MNES and are relevant to vegetation on this site and the project. A referral for assessment and determination by the Minister of DCCEEW is underway for this project, including the details of threatened flora species and communities considered likely to occur within the project site.

Jurisdiction	Legislation / Guideline	Brief description
State	*Planning Act 2016*	The *Planning Act 2016* establishes the framework for the Queensland planning system. The purpose of the legislation is to establish an efficient and accountable system of land-use planning and development assessment that will lead to ecological sustainability. The Act defines ecological sustainability as a balance between: · the protection of ecological processes and natural systems at local, regional, state and national levels · economic development · the cultural, economic, physical and social wellbeing of Queenslanders. The Planning Regulation (2017) and the State Planning Policy (2017) guide local and state government in land use planning and development by defining the Queensland Government policies relating to matters of State interest. Applications for development approval are lodged with either the local council or the State Assessment Referral Agency (SARA), depending on the nature of the proposed development, the zoning of the land and the location. The SARA provides expert assessment of specific aspects of the proposed development and can be either the assessment manager (determining the application) or a referral agency. This VMP along with an accompanying Ecological Assessment (Ecosure 2023), will be lodged as part of the assessment process for the development application to SARA.
State	State Development Assessment Provisions State code 23: Wind farm development State code 23: Wind farm development – Planning guideline	When the SARA is involved in the assessment process, the State Development Assessment Provisions are enacted to provide assessment benchmarks and consistency in assessment. The State Development Assessment Provisions contain the state codes, which are specific to particular development proposals or impacts. Each code includes a purpose and performance outcomes. Some codes include acceptable outcomes which identify one way to achieve the relevant performance outcome. The State code relevant to the proposed development is State code 23: Wind farm development. Performance outcome PO5 of the code requires that "wind farm development is designed, sited and operated to ensure that flora, fauna and associated ecological processes are protected from adverse impacts". The Guidelines accompanying the state code indicate the following is required as a minimum to demonstrate that a proposal is consistent with Performance Outcome PO5: · an ecological assessment which includes identification of risks to flora, fauna and ecological processes, bird and bat flight paths, fauna habitat and corridors and worst case vegetation impacts · assessment of alternatives and mitigation measures where impacts are likely · a preliminary Vegetation Management Plan, Fauna Management Plan, and Bird and Bat Management Plan. Other codes relating to native vegetation clearing, waterway barrier works and fish habitats may also require consideration as part of the broader application process. To address PO5 the following documents relevant to vegetation matters have been developed: · an Ecological Assessment (Ecosure 2023) · and this Vegetation Management Plan.

Jurisdiction	Legislation / Guideline	Brief description
State	NC Act	The NC Act aims to conserve nature through strategies such as dedicating and declaring protected areas for those parts of Queensland with outstanding biological diversity, natural features and wilderness values. The NC Act lists flora species of conservation significance and provides governing requirements for the surveying and permitting for works within 100 m of a known threatened or near threatened flora species. This is relevant to the site as there are known conservation significant flora present. The Ecological Assessment (Ecosure 2023) details the threatened flora species listed under the NC Act confirmed or likely to occur within the project site.
State	*Vegetation Management Act 1999* (VM Act)	The VM Act is the planning initiative underlying regional management of vegetation in Queensland. The VM Act aims to conserve remnant endangered and of concern regional ecosystems (RE), prevent land degradation and further loss of biodiversity, manage the environmental impacts of clearing vegetation and reduce greenhouse emissions. In addition to provisions related to the protection and management of native vegetation and regrowth, the VM Act contains provisions for the regulation of essential habitat for species of state significance. Essential habitat (mapped by DES) is vegetation in which a species listed as endangered, vulnerable or near threatened under the NC Act has been known to occur. Clearing or disturbance to areas of essential habitat will require compensatory habitat measures to be developed. The Ecological Assessment (Ecosure 2023) details the regulated vegetation and regional ecosystems ground truthed across the project site.
State	*Biosecurity Act 2014*	The *Biosecurity Act 2014* is administered by the Department of Agriculture and Fisheries. The Act provides management measures to protect agricultural and tourism industries and the environment from pests, diseases and contaminants. Under the Act, invasive plants and animals are categorised as either a 'Prohibited Matter' or a 'Restricted Matter'. Land owners and proponents have obligations under this Act to manage pest species. In the context of this VMP, this includes identification of potential threats and the provision of measures to avoid or manage the spread and impacts of prohibited or restricted flora matters. The Ecological Assessment (Ecosure 2023) details the flora biosecurity matters ground truthed on the project site.
State	*Water Act 2000*	The purpose of the *Water Act 2000* is to provide for the sustainable management of water and other resources. Under Section 266 of the *Water Act 2000*, a riverine protection permit is generally required from the Department of Resources to: · destroy vegetation in a watercourse · excavate in a watercourse · place fill in a watercourse. Additionally, water supply for construction purposes (e.g. access track construction/ compaction, dust suppression etc) may be required. Where this water supply is proposed to be sourced from nearby watercourses,

Jurisdiction	Legislation / Guideline	Brief description
		a permit in accordance with Section 237 of the *Water Act 2000* will be required from the Department of Resources prior to any water being extracted from the watercourse. The Ecological Assessment (Ecosure 2023) details relevant water resources (watercourses and drainage lines) present within the project site.
State	Environmental Offsets Regulation 2014	Matters of State Environmental Significance (MSES) are referenced in the biodiversity State interest under the State Planning Policy and are mapped by the Queensland Government. The Environmental Offsets Regulation 2014 also prescribes MSES for the purposes of the environmental offsets legislation in Queensland. Many of the MSES in the Environmental Offsets Regulation 2014 coincide with the MSES listed under the State Planning Policy, however, the Environmental Offsets Regulation 2014 contains additional MSES not listed in the State Planning Policy. The MSES mapping includes certain environmental values protected under Queensland legislation such as State conservation areas, marine parks, waterways and wetlands, protected habitat, fish habitat, regulated vegetation, connectivity areas and offset areas. The Ecological Assessment (Ecosure 2023) details the MSES within the project site and the potential development impacts to MSES that may require offsets.

Figure 1: Project site location

Legend

- Existing 275kV transmission line
- Road
- Watercourse
- Project boundary
- Land parcel

RES Australia

Preliminary Vegetation Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR3713
Revision: 0
Author: KF
Date: 10/26/2023

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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PR9914_VMP_MP1_SiteLocation A3

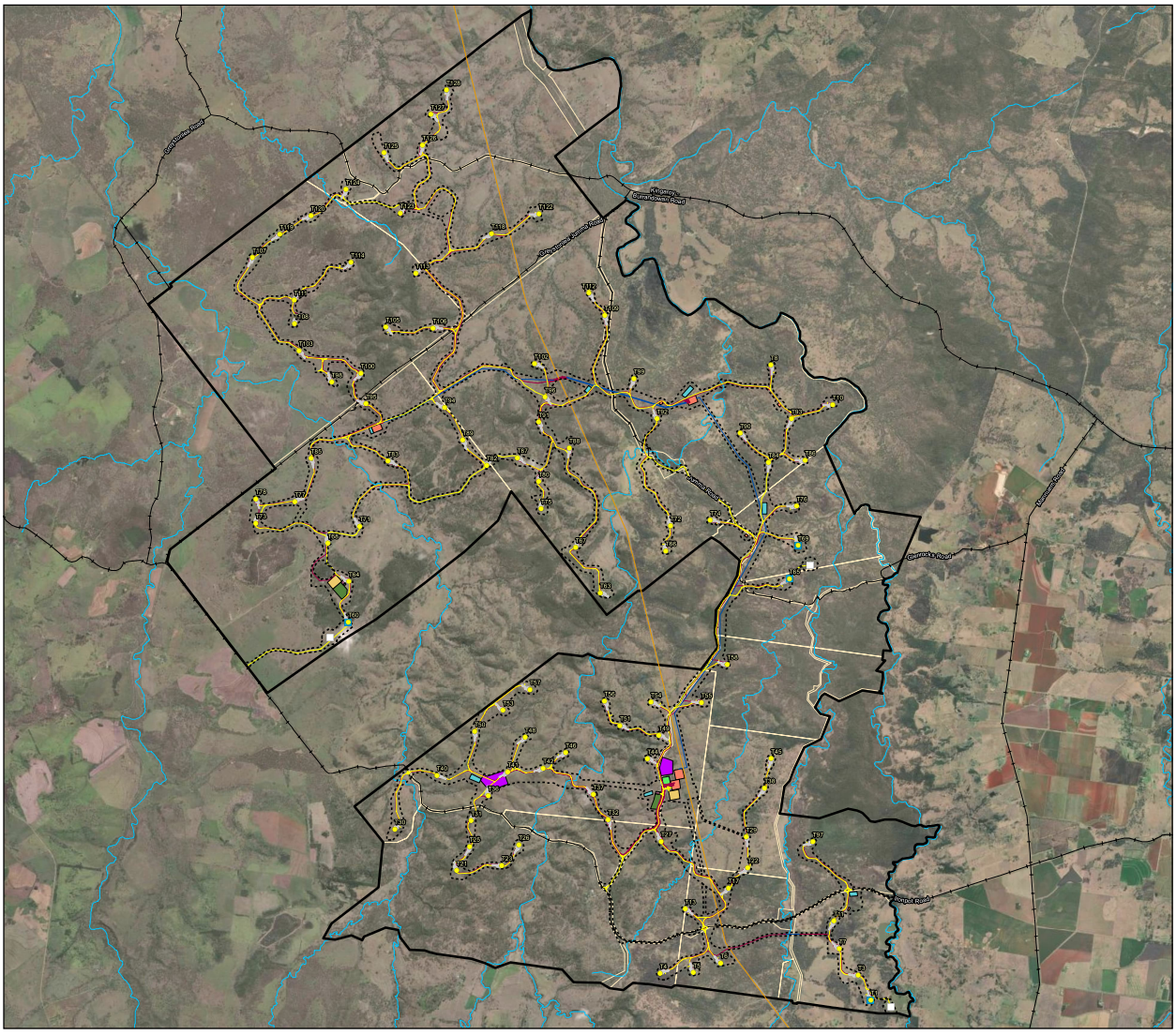

Figure 2a: Proposed development layout

Legend

- WTG
- Meteorological mast (permanent)
- Meteorological mast (temporary)
- Turbine hardstand
- Access track
- Existing 275kV transmission line
- Overhead line reticulation
- Underground reticulation
- Watercourse
- Road
- Batch plant
- Battery energy storage system area
- Laydown
- Operations and maintenance building
- Potential borrow pit
- Site compound
- Substation
- Washdown area
- Planning corridor
- Project boundary
- Land parcel

RES Australia

Preliminary Vegetation Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR3713
Revision: 0
Author: KF
Date: 11/1/2023

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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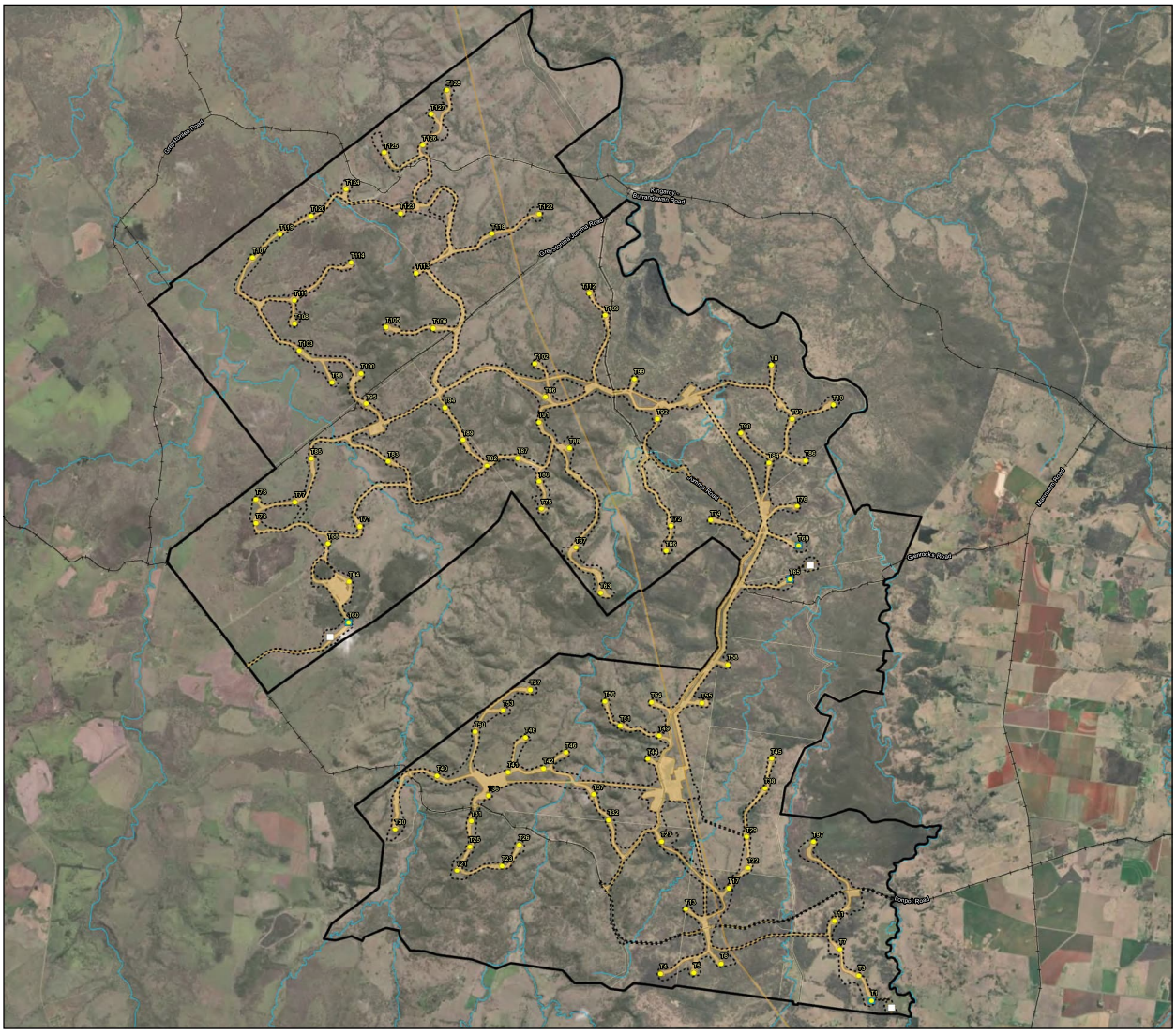

Figure 2b: Proposed clearing footprint

Legend

- WTG
- Meteorological mast (permanent)
- Meteorological mast (temporary)
- Watercourse
- Road
- Existing 275kV transmission line
- Clearing footprint
- Planning corridor
- Project boundary
- Land parcel

RES Australia

Preliminary Vegetation Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR3713
Revision: 0
Author: KF
Date: 11/1/2023

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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PR3044_VMP_MP2L_ProposedLayout_ClearingAreaA3

2 Existing environment

2.1 Landscape values and climate

The project site covers an area of approximately 17,500 ha within the South Burnett Regional Council area and lies approximately 30 km west of Kingaroy and approximately 85 km east of Chinchilla. It is currently used for cattle grazing with areas of cleared paddocks and standing vegetation. Access to the site is via Ironpot Road (Figure 1).

The climate is defined as sub-tropical with warm, humid summers and cool, dry winters. The nearest Bureau of Meteorology (BoM) weather station at Kingaroy Airport (Station 040922], approximately 30 km east of the site, has an average maximum temperature of 19.6°C in July and 30.9°C in January (BoM 2022). The average annual rainfall is 658.6 mm.

The site is located on the south eastern boundary of the Brigalow Belt (South) bioregion in the Banana-Auburn Ranges subregion. The project site occurs within a highly fragmented area with remnant and high value regrowth (HVR) vegetation occurring within generally small and discontinuous patches. Within the site, large patches occur along the ranges on the eastern boundary, which extends to vegetation to the north-east of the site and eventually connects to Dangore State Forest to the north. A large patch of vegetation in the western portion connects via vegetation near Kingaroy-Burrandowan Road to Diamondy State Forest to the west. Linear strips of vegetation provide some connectivity along Kingaroy-Burrandowan Road along the northern boundary of the project site. Riparian vegetation along larger watercourses (e.g. Boyne River, Jumma Creek, Middle Creek) provide some limited connectivity along the lower portions of the project site.

2.2 Vegetation communities

The vegetation within the site is relatively homogenous comprising narrow bands of riparian vegetation along larger watercourses and dry sclerophyll forests and woodlands dominated by lemon-scented gum (*Corymbia citriodora*) and narrow-leaved ironbark (*Eucalyptus crebra*) on ridges and slopes. One small patch of semi-evergreen vine thicket (SEVT) occurs in the south-western corner.

Non-remnant vegetation covers most of the site (15,843.79 ha or 90.56% of the site). The ground layer is sparse to dense and is dominated by grasses, including native and exotic species. A variety of native and exotic forbs are common in non-remnant areas. Tree cover is variable.

Historical and current disturbances within the site include broadscale clearing for cropping and grazing on lower lying slopes and flats and selective logging operations on upper slopes and hillcrests. Weeds are prevalent throughout disturbed areas, including dense infestations of invasive grasses (e.g. *Eragrostis curvula*, Megathyrsus maximus**) and forbs (e.g. *Glandularia aristigera*, Heliotropium amplexicaule**) in pastures and riparian areas and lantana (*Lantana camara**) thickets on volcanic derived soils.

Field-verified remnant vegetation occurs within 1,331.08 ha (7.61%) of the site and HVR within 321.35 ha (1.84%). The REs identified within the site are described in Table 2.

Table 2 REs identified within the site

RE code	VM status*	Short description	Present within the site
11.3.25	least concern	Queensland blue gum or river red gum *E. camaldulensis* woodland fringing drainage lines.	Confirmed along larger streams within the site, especially Boyne River.
11.5.20	least concern	Gum-topped box *Eucalyptus moluccana* and/or small-fruited grey gum *E. microcarpa* and/or *E. woollsiana* +/- narrow-leaved ironbark *E. crebra* woodland on Cainozoic sand plains.	Only one small area confirmed in area now excluded from project site. Possible in small unmapped areas within southeast corner of site.
11.7.6	least concern	Lemon-scented gum *Corymbia citriodora* or narrow-leaved ironbark woodland on Cainozoic lateritic duricrust.	Confirmed in one survey site in area now excluded from project site. Likely to occur in small outcrops of laterite within rocky hilly eucalypt woodland.
11.8.3	of concern	Semi-evergreen vine thicket on Cainozoic igneous rocks.	Confirmed in one small patch near south-western boundary of site.
11.11.4	least concern	*Eucalyptus crebra* woodland on old sedimentary rocks with varying degrees of metamorphism and folding on coastal ranges.	RE 11.11.4 confirmed in numerous locations throughout site. RE sub-type 11.11.4c (*Eucalyptus moluccana* dominated woodland) recorded in the site. RE sub-type 11.11.4a (*Eucalyptus tereticornis* dominated woodland) not detected during surveys.
11.11.15	least concern	Narrow-leaved ironbark woodland on deformed and metamorphosed sediments and interbedded volcanics.	Confirmed in numerous locations throughout site.
11.12.3	least concern	Narrow-leaved ironbark, Queensland blue gum, rusty gum *Angophora leiocarpa* woodland on igneous rocks especially granite.	Confirmed in numerous locations throughout site.
11.12.6	least concern	Lemon-scented gum open forest on igneous rocks (granite).	Confirmed in numerous locations throughout site.

* VM status = vegetation management status under the Vegetation Management Regulation 2000

2.3 Commonwealth listed ecological communities

No threatened ecological communities (TECs) were confirmed during field surveys. Several TECs have the potential to occur within the project site, including:

- Lowland Rainforest of Subtropical Australia – not detected during surveys

- SEVT of the Brigalow Belt (North and South) and Nandewar Bioregions – one small patch of RE 11.8.3 that can form a component of the TEC was detected in the south-western corner of the site (outside the planning corridor), however a TEC assessment concluded that the patch was not consistent with the TEC community characteristics and therefore was not a TEC
- Brigalow (*Acacia harpophylla* dominant and codominant) – not detected during surveys.

2.4 Threatened flora species and habitat

The desktop assessment (Ecosure 2023a) identified seven EPBC Act and/or NC Act listed flora species that are possible or likely to occur within the site. Table 3 summarises results of field surveys for these species.

Table 3 Results of surveys for EPBC Act and/or NC Act listed flora species

Species	EPBC Act status	NC Act status	Survey results
Acacia tingoorensis	-	V	Not detected, potential occurrence. Random meanders conducted within various eucalypt woodland communities (RE 11.3.25, 11.5.20, 11.7.6, 11.11.4, 11.11.15, 11.12.3, 11.12.6). Possible in eucalypt communities, especially in the north of the site.
Bailey's cypress pine (*Callitris baileyi*)	-	NT	**Confirmed.** Random meanders conducted within communities with dry rainforest characteristics (RE 11.8.3, areas of RE 11.12.6 with understorey containing rainforest species). One individual recorded in non-remnant riparian vegetation on creek bank near Glenrocks Road. Two individuals detected in a patch of RE 11.8.3 that is now outside the project site. Not detected in the only field-verified patch of RE 11.8.3 in the south-western corner of project site. Likely in dry rainforest communities in rocky hilly areas (but these communities only detected in one small patch in the south-western corner of project site). Possible in riparian areas with some vine thicket elements. No further surveys recommended as no development proposed in or adjacent to vine thicket habitats.
small-leaved denhamia (*Denhamia parvifolia*)	V	V	Not detected and unlikely to occur. Random meanders conducted within communities with dry rainforest characteristics (RE 11.8.3, areas of RE 11.12.6 with understorey containing rainforest species). Unlikely as very limited dry rainforest habitat present on the site.
wandering peppercress (*Lepidium peregrinum*)	E	LC	Not detected. Random meanders conducted within various riparian communities (RE 11.3.25). Several populations of a *Lepidium* species were detected, but these were the introduced *L. bonariense* and *L. africanum*. Nearest known records are over 20 km from the site in Bunya Mountains (within very different montane habitat). Possible in riparian communities, especially along Boyne

Species	EPBC Act status	NC Act status	Survey results
			River. Further surveys recommended if development is proposed in additional riparian areas outside of the existing planning corridor.
Mt Berryman phebalium (*Phebalium distans*)	E	E	Not detected and unlikely to occur. Random meanders conducted within communities with dry rainforest characteristics (RE 11.8.3, areas of RE 11.12.6 with understorey containing rainforest species). Unlikely as very limited dry rainforest habitat present on the site.
Austral cornflower (*Leuzea australis* synonym *Rhaponticum australe*)	V	V	Not detected. Random meanders conducted within various eucalypt woodland communities (RE 11.3.25, 11.5.20, 11.7.6, 11.11.4, 11.11.15, 11.12.3, 11.12.6). No known records within 10 km. Possible in areas of heavy clay soils derived from basalt, which occur only in the south-western corner of the project site. Unlikely in other areas. Further surveys recommended if development proposed in areas of heavy black soils outside of the existing planning corridor. However, no development is currently proposed in these areas of the site.
Austral toadflax (*Thesium australe*)	V	V	Not detected. Random meanders conducted within various eucalypt woodland communities (RE 11.3.25, 11.5.20, 11.7.6, 11.11.4, 11.11.15, 11.12.3, 11.12.6). Queensland Herbarium records from HVR RE 11.3.25 beside Jarail Road, approximately 1 km west of western boundary. Possible in eucalypt communities in damp areas. Within the project site, this habitat is restricted to riparian areas, especially along Boyne River (i.e. RE 11.3.25). Further surveys recommended if development proposed in additional riparian areas outside of the existing planning corridor.

EPBC Act status: CE – critically endangered, E – endangered, V – vulnerable

NC Act status: E – endangered, V – vulnerable, NT – near threatened, LC – least concern

2.5 Threatened fauna habitat

The Ecological Assessment Report (Ecosure 2023a) detected five EPBC Act and /or NC Act listed threatened fauna species within the site (Table 4). Vegetation within the project site provides foraging, breeding and denning / roosting habitat for these species.

Table 4 Results of surveys for EPBC Act and/or NC Act listed fauna species

Species	EPBC Act status	NC Act status	Survey results
koala (*Phascolarctos cinereus*)	E	E	**Confirmed.** 15 individuals sighted (12 within and 3 adjacent to the project site), 14 scat detections, 7 scratched trees recorded during fauna surveys within the project site. Primarily associated with RE 11.3.25, but food species are also a component of remnant, HVR

Species	EPBC Act status	NC Act status	Survey results
			and non-remnant vegetation (including REs 11.5.20, 11.7.6, 11.11.4, 11.11.15, 11.12.3 and 11.12.6).
greater glider (*Petauroides volans / Petauroides armillatus*)	E	E	**Confirmed.** Suitable habitat exists within productive communities on alluvial soils dominated by Queensland blue gum (RE 11.3.25) and tall eucalypt forests. A total of 70 greater gliders were detected during spotlighting surveys within habitats containing REs 11.11.4, 11.11.15, 11.12.3 and 11.12.6, primarily on hill crests. Habitat assessments recorded large hollow-bearing trees in all of these REs, which may provide denning resources.
grey-headed flying fox (*Pteropus poliocephalus*)	V	LC	**Confirmed.** 12 individuals were observed or heard foraging on site during spring 2021 surveys when food species were in flower. Roosting sites (camps) are usually found in dense forest adjacent to waterbodies. This species forages in flowering trees or rainforests, eucalypts, paperbarks and banksias within 50 km of camps, dispersing in response to food availability. No habitats within the project site are considered to be critical food sources for this species and the nearest known grey-headed flying-fox camp is near Cooyar (38 km south-east of site).
glossy black cockatoo (*Calyptorhynchus lathami lathami*)	V	V	**Confirmed.** Four individuals were observed and 21 signs of foraging activity (orts) were detected within the project site. Suitable foraging habitat exists in small patches of *Allocasurina torulosa*, *A. littoralis*, *A. luehmannii* and *Casuarina cunninghamiana* amongst forest and woodland communities across the site. Large hollow-bearing trees in remnant REs may provide nesting resources.
white-throated needletail (*Hirundapus caudacutus*)	V, Mi	V	**Confirmed.** The white-throated needletail was observed during bird utilisation surveys (232 sightings in total between 2018 to 2023). This species is almost entirely aerial and rarely lands, none have been observed roosting in the project site. It does not breed in Australia.

EPBC Act status: E – endangered, V – vulnerable, Mi - migratory

NC Act status: E – endangered, V – vulnerable, LC – least concern

2.6 Other conservation significant species

Other conservation significant species also detected within the project site include species listed as migratory under the EPBC Act and / or SLC under the NC Act (Table 5). Vegetation within the project site provides foraging, and breeding habitat for the short-beaked echidna. For the bird species the vegetation provides foraging and roosting habitat for the rufous fantail and satin flycatcher, and roosting habitat for the white-throated needletail. The fork-tailed swift is entirely arial and does not rely on the vegetation present within the project site.

Table 5 Results of surveys for listed migratory and/or SLC fauna species

Species	EPBC Act status	NC Act status	Survey results
short-beaked echidna (*Tachyglossus aculeatus*)	-	SLC	**Confirmed.** The short-beaked echidna was detected at six locations within the project site. Short-beaked echidnas use all habitat types that occur in Australia and are one of the few species that has an entirely Australia-wide distribution.
rufous fantail (*Rhipidura rufifrons*)	Mi	SLC	**Confirmed.** Three rufous fantails were observed in areas of eucalypt forest with an understorey of shrubs and/or vine thicket species during spring and autumn surveys. Potential habitat for this species is limited to areas of vine thicket, and patches of riparian vegetation or eucalypt forest with a dense understorey.
satin flycatcher (*Myiagra cyanoleuca)*	Mi	SLC	**Confirmed.** Three satin flycatchers were observed across the project site. Potential habitat for this species comprises a wide range of eucalypt forest and woodland and often in gullies or along watercourses.
fork-tailed swift (*Apus pacificus*)	Mi	SLC	**Confirmed.** Two fork-tailed swifts were observed flying across the project site. This species is an exclusively aerial forager, which is believed to roost on the wing. The fork-tailed swift does not breed in Australia.

EPBC Act status: Mi - migratory

NC Act status: SLC – special least concern

3 Impacts and mitigation

3.1 Impacts of proposed construction on vegetation and habitat

This section summarises the potential impacts of project construction and/or operation to ecological values of the site. As the design and location of infrastructure (e.g. WTGs, tracks, substations, etc.) may be refined during detailed design and micro-siting, the current planning corridor layout presented in Figure 2 has been used to assess potential maximum impacts.

The development process for wind farms occurs gradually over time as new data is gained and analysed and solutions are developed to overcome resource, engineering, environmental and social issues. In practical terms, this means that the locations of WTGs, construction pads, cable routes and tracks change frequently, but generally within a defined planning corridor. This process is termed 'micro-siting' and allows for small changes to the project design to overcome site constraints. The current planning corridor shown in Figure 2 represents the maximum proposed clearing footprint and is expected to be reduced by ongoing refinement in the design and micro-siting of infrastructure.

The proposed project may result in direct clearing of up to 1,062.14 ha of regulated vegetation, including 16.98 ha of remnant and 1,045.16 ha of non-remnant areas. Additional potential impacts to vegetation that may result from the construction of the project, include:

- direct impacts
  - injury, mortality or displacement of native flora and faunaloss of vegetation communities (remnant and HVR)
  - loss of habitat for fauna (which may include remnant, HVR and non-remnant vegetation)
  - loss of habitat for conservation significant species (threatened and near threatened flora and fauna species and migratory and SLC fauna species)
  - fragmenting vegetation patches and habitat through construction of tracks and easements for overhead powerlines[1].
- indirect impacts
  - reduced resilience of populations to survive future disturbance
  - loss of resources such as flowers, nectar, seeds, fruits and foliage
  - loss of microhabitats including leaf litter, hollow logs, tree hollows, and substrate for specific fauna
  - introducing and spreading weeds, pest animals and pathogens into new areas
  - contributing to erosion and sediment loss into receiving catchments
  - dust from construction activities impacting on adjacent vegetation.

In determining the potential loss of vegetation and habitat from construction activities, the

[1] Powerlines constructed for the project may be either overhead or in conduits underground.

following assumptions have been made:

- WTG locations and associated hardstand areas are contained in the current planning corridor layer
- proposed access tracks and existing tracks to be upgraded are:
  - designed using detailed mapping of contour data (to avoid steep terrain), waterways (to avoid areas within 50 m of waterways where possible) and roads (to minimise ingress / egress points onto public roads), supported by site visits to refine designs
  - contained within the planning corridor to allow for micro-siting of access tracks
  - powerlines from WTGs to the substation will generally be underground and contained within the proposed planning corridor (although some overhead powerlines will be required)
- larger infrastructure zones will be required in some areas to accommodate associated infrastructure (e.g. temporary construction facilities, permanent operation and maintenance facilities, substation and switching yard)
- minor clearing and road-widening along a transport route from Brisbane Port to the project site (as described in Ecosure 2023b).

Construction of access tracks, WTGs and supporting infrastructure will likely exacerbate impacts to connectivity by:

- creating wider gaps within vegetation patches or creating new gaps
- increasing edge effects
- further facilitating introductions of pest animals and weeds into new patches.

The potential impacts of the project will be addressed in accordance with the impact minimisation hierarchy to:

- firstly avoid, then minimise, then mitigate any potential impacts on ecological values
- compensate (i.e. offset) any significant residual impacts.

Where possible, the location of supporting infrastructure for WTGs have been sited to avoid impacts to significant vegetation. Impacts that cannot be avoided will be minimised through micro-siting and through the detailed design phase, where possible. The potential impacts of proposed infrastructure are likely to present a maximum extent of clearing and are anticipated to be reduced by ongoing refinement in the design and micro-siting of infrastructure.

There is one small patch of SEVT (RE 11.8.3) on the south-western edge of the project site (Figure 3). This community will not be impacted by the project as the current planning corridor is over 450 m from the patch.

The maximum area of remnant vegetation to be cleared under the current design is summarised in Table 6 and mapped in Figure 3. Up to 16.98 ha of remnant vegetation may

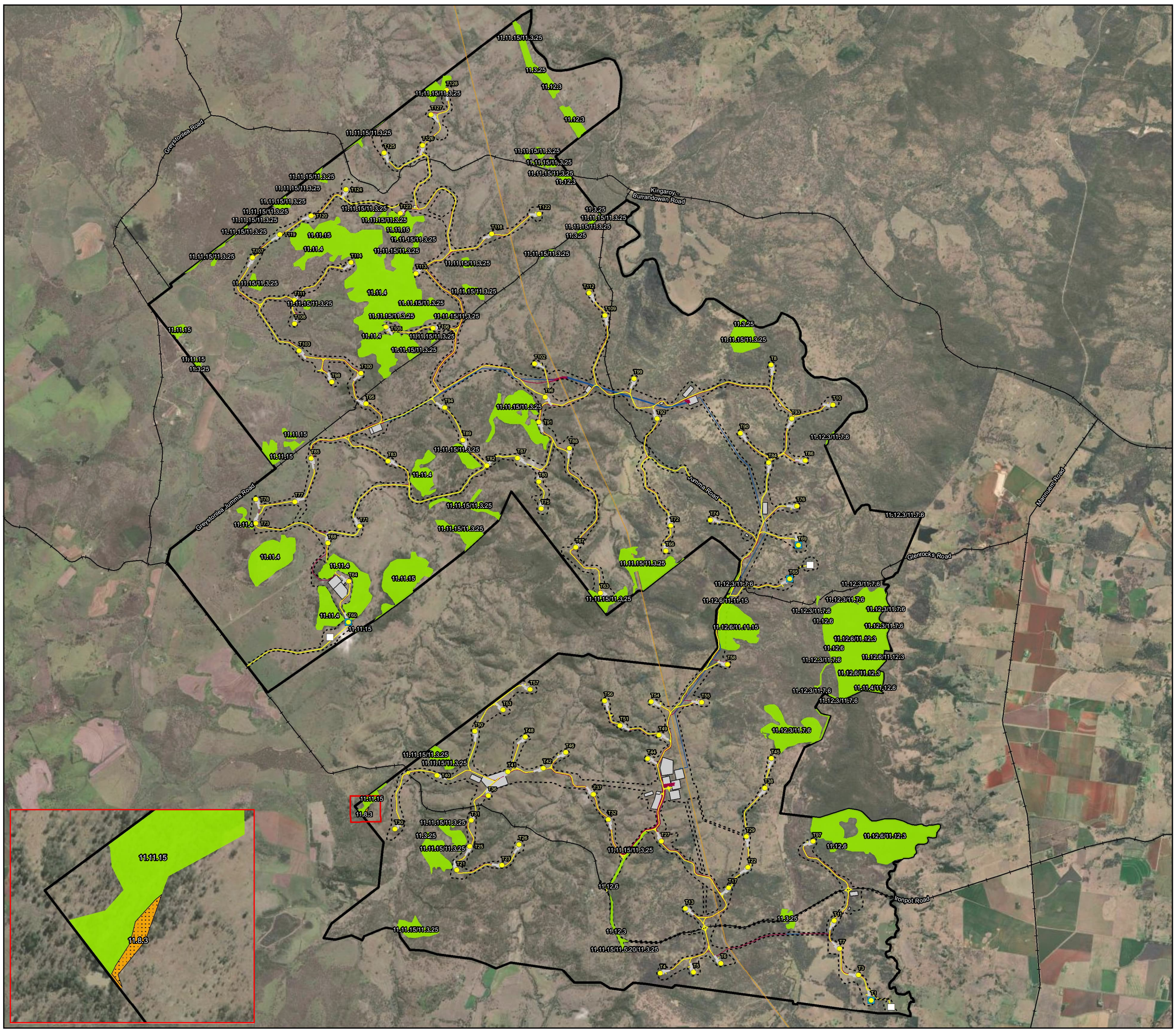
be cleared for construction and operational works within the clearing footprint.

HVR vegetation has been avoided in the design phase, and no HVR vegetation occurs within the planning corridor. When compared to equivalent RE communities within the project site, these areas represent only 1.51% of remnant vegetation within the site. When compared to all ground truthed REs in the project site the proposed works will clear only 1.03% of remnant/HVR vegetation within the site. Vegetation that may be cleared is comprised of least concern REs only. No of concern or endangered REs, or TECs, will be impacted.

Table 6 Impact of project infrastructure on remnant vegetation

RE	VM Act status	Total area within clearing footprint (ha)	Total site (ha)	% of total project site
11.11.4	Least concern	0.43	462.86	0.09%
11.11.15/11.3.25	Least concern	4.53	456.05	0.99%
11.12.6	Least concern	0.44	11.97	3.68%
11.12.6/11.11.15	Least concern	10.82	58.52	18.49%
11.12.3/11.7.6	Least concern	0.75	103.54	0.72%
11.12.3	Least concern	0.01	33.54	0.03%
Total (equivalent REs)		**16.98**	**1,126.48**	**1.51%**
Total (all REs)		**16.98**	**1,652.44**	**1.03%**

Figure 3: Ground truthed vegetation and proposed clearing for WTGs and access tracks



Legend

- WTG
- Meteorological mast (permanent)
- Meteorological mast (temporary)
- Turbine hardstand
- Access track
- Existing 275kV transmission line
- Overhead line reticulation
- Underground reticulation
- Road
- Infrastructure
- Planning corridor
- Project boundary
- SEVT

Remnant RE

- Endangered - dominant
- Of concern - dominant
- Of concern - subdominant
- Least concern

RES Australia

Preliminary Vegetation Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR3713
Revision: 0
Author: KF
Date: 10/26/2023

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

ecosure improving ecosystems

PR6944_VMP_MP3_GTRE
A3

3.2 Impacts of proposed construction on threatened flora and habitats

Based on the desktop assessment and field surveys, four EPBC Act and/or NC Act listed species may potentially occur within the project site (wandering peppercress, Austral toadflax, Austral cornflower and Bailey's cypress pine).

The current design may remove up to 15.28 ha of potential habitat for wandering peppercress and Austral toadflax within the clearing footprint. Ongoing refinement of infrastructure design is expected to reduce impacts to riparian vegetation by:

- utilising existing farm tracks for watercourse crossings wherever possible
- reducing clearing widths at watercourse crossings
- minimising other infrastructure within riparian zones.

Austral cornflower may potentially occur in woodlands on heavy clay soils derived from basalt, which were detected only in the south-western edge of the project site. As these areas are outside the planning corridor, this species is highly unlikely to be impacted by the project.

Bailey's cypress pine was recorded in riparian and dry rainforest habitat. Within the project site the species may occur in areas of dry rainforest communities in rocky hilly areas (but these communities only detected in one small patch on the south-western boundary of the site) and riparian areas with some vine thicket elements.

Table 7 summarises areas of potential habitat for threatened flora species that may be impacted by proposed infrastructure.

Table 7 Impact of project infrastructure on threatened flora habitat

Species	Potential habitat	Maximum proposed clearing within clearing footprint (ha)	Total habitat within project site (ha)	% of total habitat within project site
Wandering peppercress	Remnant/HVR RE 11.3.25 Riparian areas: 100 m corridor around stream order 3 and 4 watercourses and 200 m corridor around stream order 5 and 6 watercourses	15.28	980.19	1.55%
Austral toadflax	Remnant/HVR RE 11.3.25 Riparian areas: 100 m corridor around stream order 3 and 4 watercourses and 200 m corridor around stream order 5 and 6 watercourses	15.28	980.19	1.55%
Austral cornflower	Woodlands on soils derived from basalt (land zone 8)	0	0.6	0%

Species	Potential habitat	Maximum proposed clearing within clearing footprint (ha)	Total habitat within project site (ha)	% of total habitat within project site
Bailey's cypress pine	REs with dry rainforest characteristics (RE 11.8.3, areas of RE 11.12.6 with understorey containing rainforest species)	0	0.63	0%

The impacts of construction works on fauna and fauna habitats will primarily involve the loss of native habitats and habitat features that provide specialised shelter or foraging resources such as hollow-bearing trees (nesting and denning resources for birds and arboreal mammals), woody debris (shelter habitat for reptiles), flowering/fruiting species (food resources for a variety of species) and structurally complex vegetation (shelter habitat for small birds). Impacts to fauna may therefore include:

- removal of foraging habitat (e.g. primary and secondary food trees for koala)
- removal of hollow-bearing trees (e.g. nesting/denning hollows for greater gliders and glossy black cockatoos)
- removal of hollow logs and coarse woody debris
- removal of potential and active breeding sites
- death or injury to fauna during clearing
- fauna collisions with construction vehicles
- fragmentation of habitat areas and movement corridors
- facilitating introduction of pest plants and animals into new areas.

3.3 Proposed measures to avoid construction impacts

Most impacts to ecological values have been avoided through siting of infrastructure away from sensitive values. This includes the placement of WTGs and tracks away from remnant vegetation and watercourses as far as possible. As detailed design progresses, infrastructure will be micro-sited to avoid important habitat features such as hollow-bearing trees and food trees, where possible.

The project site was reduced during project redesign to avoid large patches of remnant and HVR vegetation to the east of the site. Additionally, the current planning corridor will avoid the largest, most intact patches of vegetation along the eastern boundary and in the north west section of the site. The current design will remove up to a maximum of 16.98 ha of ground truthed remnant vegetation (Table 6, Figure 3). This clearing represents 1.03% of the total remnant vegetation in the project site. As the project design progresses, all practicable efforts will be made to avoid impacts to vegetation communities and fauna habitats, including seasonal impacts to flora and fauna.

No TECs will be cleared or disturbed by the proposed development.

3.4 Impacts of proposed operations and decommissioning on vegetation and habitat

Due to the nature of wind farm operations, there are unlikely to be significant ongoing impacts to vegetation or flora values. However, operational impacts may include:

- erosion of soils from tracks, powerline easements and WTG pads
- introduction and spread of weeds from movement of vehicles, equipment and machinery.

The decommissioning process has not been determined at this stage and therefore the proposed impacts to vegetation and flora values are unknown. However, all decommissioning activities shall be contained within the clearing footprint used during construction of the project. In other words, clearing of vegetation outside of previously cleared areas is not proposed. There may be areas rehabilitated post-construction that require clearing to allow decommissioning activities to progress. Such clearing will be completed as per the requirements in Section 4.3, and further rehabilitation of these areas will occur post-decommissioning.

4 Vegetation management

4.1 General management measures

- Vegetation clearing shall be avoided by relocating infrastructure away from existing vegetation wherever practicable.
- All site personnel will attend environmental training as part of the site induction prior to entering site. Areas identified for vegetation clearing are to be clearly defined and detailed in site inductions, including “no-go” zones.
- Utilise existing tracks and previously disturbed areas where practical to minimise clearing required.
- Impacts to vegetation should be prioritised so that lower value vegetation is removed in preference to higher value vegetation. For example, non-remnant vegetation should be prioritised for removal over HVR vegetation which should be prioritised for removal over remnant vegetation. Prioritisation of vegetation removal should be completed in consultation with a suitably qualified ecologist.
- Where impacts to vegetation cannot be avoided, clearing shall be limited to the amount necessary to safely construct and operate infrastructure.
- Consideration should be given to trimming trees rather than felling.

4.2 Management approach prior to clearing

- Due to the large size of the site, the Ecological Assessment Report (Ecosure 2023a) noted that it was not possible to thoroughly survey all areas of the site. Surveys aimed to provide a broad-scale understanding of the vegetation communities present on the site, and targeted areas of remnant and HVR vegetation. It is recognised that protected plants can utilise areas of mapped non-remnant vegetation provided that required habitat features are present, such as along linear roadside strips or riparian vegetation along watercourses which are too small to map at scale.
- Therefore, pre-clear surveys targeting the exact area to be cleared will be undertaken to ensure that protected plants within the clearing footprint are detected and avoided, as far as practicable. This will involve a suitably qualified and experienced ecologist walking proposed clearing areas within potential habitat areas searching for conservation significant plants.
- Micro-siting of infrastructure must first attempt to avoid impacting protected plants, if detected. This may include employing alternative configurations of WTG pads, relocating access tracks or considering alternative construction methods.
- Targeted surveys will also be completed within areas of mapped non-remnant vegetation that nonetheless contain potential habitat for conservation significant plants, such as narrow strips along road corridors, watercourses, etc.

4.2.1 Identification of management zones

- Vegetation within the project site will be demarcated into broad management zones:
  - significant vegetation to be retained, comprising:
    - remnant least concern REs that provide threatened flora and/or fauna habitat
    - HVR least concern REs that provide threatened flora and/or fauna habitat
    - non-remnant vegetation that is riparian vegetation
  - other vegetation to be retained
    - all other non-remnant vegetation
  - vegetation to be removed within significant areas
  - vegetation to be removed outside of significant areas.
- Significant areas are defined as remnant vegetation, HVR vegetation, watercourse areas (e.g., watercourse buffers as defined by the VM Act) and habitat areas for conservation significant species. Vegetation within significant areas outside the clearing footprint will be marked as 'no-go" zones.
- The extent of vegetation clearing and "no-go" zones will be clearly identified on construction plans, and visibly marked in the field prior to clearing activities to minimise the risk of accidental clearing.
- Once installed, clear marking must be maintained during the construction period to prevent accidental clearing.

4.2.2 Protection of significant vegetation

- Significant vegetation shall be protected from unintentional harm during clearing works of adjacent vegetation.
- Onsite demarcation of significant vegetation shall include use of visible tape, flagging or other suitable method of identification.
- Site access shall be from designated access points only from the surrounding road network and via designated access tracks. No new tracks shall be created other than those identified on construction drawings.
- No unauthorised vehicle or pedestrian access is permitted into vegetation to be retained or other areas not identified for infrastructure construction.
- No refuelling or fluid changes shall occur within vegetation to be retained outside of the clearing footprint. Refuelling and fluid changes shall occur only when appropriate fuel management measures (e.g. lining, bunding, etc) are present.
- Care shall be taken when machinery is working adjacent to retained vegetation to ensure unintentional impacts to trees are minimised such as damage to branches, trunk or root zone of adjacent trees.

4.2.3 Tree protection zones

- Tree protection measures shall be in place for hollow-bearing trees and/or all vegetation (especially large trees) to be retained adjacent to works. Tree protection zones (TPZs), which are a combination of the root area and crown area requiring protection, will be established to protect adjacent vegetation from clearing activities (e.g. refer to Australian Standard AS4970-2009 Protection of trees on development sites). If works are required within a TPZ, a suitably qualified and experienced arborist (Australian Qualification Framework Level 5) will be consulted for alternative protection measures.
- If encroachment to hollow-bearing trees and/or large trees is required, the following shall be identified for each tree:
  - species
  - diameter at breast height (DBH) measured 1.4 m from the ground
  - TPZs (calculated as DBH x 12)
  - crown spread
  - structural root zone shall only be considered if major encroachment into TPZ is required and other alternatives are not possible (e.g. earthworks).
- The following activities are not permitted within the TPZ (relevant to the proposed activities on the site), or in areas of retained vegetation:
  - machine excavation including trenching
  - excavation for silt fencing
  - excavating holes for tubestock
  - storage
  - preparation of chemicals, including preparation of cement products
  - parking of vehicles and machinery
  - refuelling
  - dumping of waste
  - wash down and cleaning of equipment
  - placement of fill
  - lighting of fires
  - soil level changes
  - temporary or permanent installation of utilities and signs
  - physical damage to the tree.
- Any deviations from these measures shall be completed in consultation with an Australian Qualification Framework Level 5 qualified and experienced arborist. If advised by the arborist, they also must be present for any deviation works.
- Protective fencing, webbing or other means of protection as advised by the arborist (Australian Qualification Framework Level 5) shall be used to protect trees to be

retained (e.g. refer to Australian Standard AS4687-2007 – Temporary fencing and hoardings).

4.3 Management approach during clearing

4.3.1 Vegetation to be retained and protected

- All vegetation is proposed to be retained outside of the clearing footprint for the WTG pads, access tracks and other infrastructure locations.
- Vegetation to be retained will be clearly identified on approved drawings to be kept onsite. The clearing footprint shall be surveyed and marked prior to clearing commencing.

4.3.2 Vegetation to be removed

- All vegetation identified within the clearing footprint may be removed and the final decision to remove vegetation will be made through the avoid, minimise and mitigate hierarchy process.
- Where possible, overhanging limbs of trees should be removed rather than removing the entire tree.
- Along the buffer zone of clearing areas and retained vegetation, trees are to be felled towards the clearing area to prevent damage to adjacent retained vegetation.
- The vegetation to be cleared will be identified on approved drawings to be kept on site.
- The vegetation will be removed by specialist selective clearing machinery (i.e. excavator, bulldozer, grader or other earthmoving equipment as appropriate). Chaining or other methods of broadscale clearing are prohibited.
- Cleared vegetation and soil stockpiled within the planning corridor is not to be placed within the TPZ of any retained vegetation (i.e. not be pushed up against tree bases) or stored against fence lines.
- Vegetation to be stockpiled should not impede fauna movement.

4.4 Management approach following clearing

- No vegetative waste shall be burnt on site.
- Where possible, logs and hollow limbs cleared during construction should be placed in adjacent vegetation, so they can be used for habitat.
- Cleared vegetation shall be mulched onsite and as soon as possible after clearing.
- Mulch generated onsite shall be reused for rehabilitation and soil stabilisation purposes.

- Areas of weed infestation shall be treated, cleared and disposed of separately, if possible, and preferably to a waste facility that accepts weed material. Weed material may also be buried onsite if in accordance with the approved protocols stated under the *Queensland Biosecurity Act 2014* for management of biosecurity matters.
- No mulch containing biosecurity material shall be reused on site.
- Once vegetation has been cleared and mulch stockpiled, the topsoil shall be scraped and stockpiled separately. Should topsoil require stockpiling for an extended period, a cover crop should be established over the stockpile to minimise erosion and retain soil health.

4.5 Weed management

4.5.1 Weed and seed hygiene

- All vehicles and machinery entering the site shall be washed down to remove all seed or propagative material of weed species and soil material that may contain weed material. *Vehicle and machinery cleandown procedures* published by the Department of Agriculture and Fisheries (DAF 2019) shall be followed (Appendix 1). Two permanent washdown stations have been proposed for the project site (Figure 2). One washdown station is suggested in the planning corridor between T44 and T27 for vehicles accessing the site from the southern entry point on Ironpot Road and a second washdown Station at T64 for vehicles accessing the site from the western entry point on Ironpot Road. To cope with construction activities and for additional protection during high traffic periods, extra weed washdowns will be established between properties as needed.
- Vehicles and machinery shall either hold a Weed Hygiene Declaration Form (Biosecurity Queensland) or Vehicle Hygiene Inspection Report and operators must be able to produce the documents upon request.
- Washdowns may be performed by all site personnel, however issuing of declarations or reports shall be completed only be trained operators, preferably holding the nationally recognised certification AHCBIO203 - *Inspect and clean machinery, tools and equipment to preserve biosecurity.*
- Vehicles and machinery shall be designated ‘clean’ if they remain on sealed roads or well- maintained gravel roads during the project construction. If vehicles and machinery are required to pull over onto the road verge, care shall be taken to choose areas that do not contain weed seed such as long grass. Otherwise, clean status will be lost.
- Gravel roads and tracks within the site and surrounds should be regularly visually inspected to determine the risk to vehicles and machinery losing clean status.
- Should vehicles and machinery lose their clean status, they shall be washed down prior to entering a different property. A new declaration form or inspection report shall be gained.

- Vehicles and machinery shall be washed down every three months regardless of whether they have retained clean status.
- Topsoil is to be stockpiled within proximity to removal site, within a designated stockpile area, outside of vegetation TPZs and within its respective biosecurity zone. Priority is to be given to reuse of topsoil within the same vegetation community type to retain native seed banks.
- A record of all material imported on site is to be maintained. This record is to include material description, quantity, source and initial deposition location on site. A weed free declaration will be sought from each source location/supplier.

4.5.2 Weed control

- Areas containing substantial weed material shall be treated prior to clearing. Weeds shall be treated with an appropriate herbicide or method depending on the weed species present and location.
- A list of introduced flora species detected on the project site is summarised in Appendix 2.
- Table 8 lists introduced species classified as a weed of national significance (WoNS) and status under the *Queensland Biosecurity Act 2014*. Specific treatments and herbicide application rates shall be completed as per the Queensland's Department of Agriculture and Fisheries and New South Wales Department of Primary Industries fact sheets provided in Section 6.
- Herbicide is not to be sprayed near natural waterways or dams within two days of rain.

Table 8 WoNS and restricted invasive species detected on the project site

Species	Common name	WoNS*	*Biosecurity Act 2014* status	Treatment summary^
Anredera cordifolia	Madeira vine	Yes	Restricted invasive species	Scrape stem and paint with herbicide suitable for this method and species Foliar/blanket spray
Baccharis halimifolia	groundsel	-	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray
Dolichandra unguis-cati	cat's claw creeper	Yes	Restricted invasive species	Cut stump and paint with herbicide suitable for this method and species
Lantana camara	lantana	Yes	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray

Species	Common name	WoNS*	*Biosecurity Act 2014* status	Treatment summary^
Lantana montevidensis	creeping lantana	-	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray
Ligustrum lucidum	broad-leaf privet	-	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray Stem injection
Opuntia stricta	prickly pear	Yes	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray Stem injection
Opuntia tomentosa	velvety tree pear	Yes	Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray Stem injection
Sporobolus fertilis	giant Parramatta grass	-	Restricted invasive species	Spray with herbicide suitable for this method and species Rehabilitate with pasture grasses to control infestations
Tamarix aphylla	athel pine	Yes	- Restricted invasive species	Basal bark spray Cut stump and paint with herbicide suitable for this method and species Foliar/blanket spray Stem injection

* WoNS – weed of national significance

Other exotic species include pasture grasses that have been introduced to improve the forage value of the land, including Rhodes grass (*Chloris gayana**), couch (*Cynodon dactylon*, C. nlemfuensis**) and red Natal grass (*Melinis repens**).

4.6 Progressive rehabilitation

- The final operational footprint of the project will be less than the area used for construction of the project. Therefore, some areas of vegetation cleared for WTG pads and infrastructure installation will be progressively rehabilitated to form a stable landform.
- Progressive rehabilitation shall comprise the following process:

- Remove gravel from infrastructure locations.
- Spread stockpiled topsoil across the rehabilitation areas.
- Seed the topsoil with a grass species mix appropriate to the pre-clearing vegetation community within the area. Native grasses and non-invasive exotic pasture grasses (e.g. Rhodes grass *Chloris gayana*) may be considered in cleared pasture areas, in consultation with landholders.
- Apply initial watering to initiate germination and follow up watering to ensure grass growth.

- It is not intended to supplement grass seeding with native tree or shrub species seed or tubestock. However, the native soil seedbank is likely to remain viable during soil stockpiling and will aid in natural rehabilitation of disturbed areas.

5 Roles and responsibilities

5.1 Training

- All construction contractors and visitors will complete an induction prior to work on or visiting the site. The induction must include a component on flora present on the site and management measures in place to avoid, minimise or mitigate impacts to significant ecological values. Vegetation management inductions must include:
  - vegetation clearing restrictions
  - “no-go” zones
  - threatened flora
  - habitat and fauna awareness
  - other environmentally sensitive areas
  - declared plants and noxious weeds.
- A record of inducted personnel and visitors must be kept on site at all times.

5.2 Roles and responsibilities

- All construction contractors and site visitors have a duty of care as per Section 319 of the *Environmental Protection Act 1994* to prevent environmental harm.
- All construction contractors and site visitors are obligated to report incidents involving flora or their habitat. Reports must be made to the contractor’s immediate supervisor or responsible person in charge of visitors.

5.3 Monitoring and reporting

- Monitoring and reporting requirements will be implemented as part of this VMP.
- The Principal Contractor shall keep daily records of vegetation cleared and weeds treated. The reports are to include:
  - date
  - infrastructure name
  - area cleared (estimate in ha)
  - type of vegetation cleared (remnant, HVR, non-remnant)
  - RE code, if applicable
  - weeds treated
  - treatment methods
  - herbicides used
  - quantity of herbicides used.
- The Principal Contractor shall maintain records of rehabilitation works including:

- date rehabilitation occurred
- infrastructure name (where relevant)
- area rehabilitated (estimate in ha)
- rehabilitation method
- watering regime
- vegetation groundcover.

- Where unintentional clearing of vegetation to be retained occurs, the clearing shall be internally investigated through the Principal Contractors incident management framework within 24 hours of the contractor becoming aware of the unintentional clearing, and as required notification to relevant government agencies in accordance with development approvals and the *Environmental Duty of Care* responsibilities.

6 Weed fact sheets

Restricted invasive plant

Madeira vine

Anredera cordifolia

Madeira vine is an invasive, South American vine that blankets and smothers trees, shrubs and understory species. It grows prolifically at rates of up to one metre per week and the weight of the vine can cause canopy collapse of mature native trees. It produces large numbers of subterranean and aerial reproductive tubers that persist in the environment and make effective management difficult.

The impacts of Madeira vine can be so severe that it causes irreversible damage to the invaded ecosystem, leading to its categorisation as a transformer species.

Madeira vine is considered one of Australia's worst environmental weeds and has been listed as a Weed of National Significance.

Legal requirements

Madeira vine is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Queensland Government

Description

Madeira vine is also known as potato vine or lambs tail vine. It has fleshy, waxy green, heart-shaped leaves which are usually 4–5 cm in length. The stems are slender and hairless, initially herbaceous but becoming woody with age.

Clusters of 5 mm to 25 cm aerial tubers are produced along the length of the stem. These are light brown or green, and 'warty' in appearance. The vine also produces potato-like subterranean tubers which can grow up to 20 cm in diameter and at depths of up to 1 m.

Madeira vine produces dense blankets of creamy flower spikes from December to April. The flower spikes are approximately 10 cm long and are made up of numerous small flowers along a drooping, central stem.

Distribution and habitat

Madeira vine is common in urban areas where it has been introduced as a garden plant. It typically invades riparian vegetation, the edges of rainforests, tall open forests and damp sclerophyll forests.

In Queensland, Madeira vine infestations are most highly concentrated in the coastal and hinterland regions of south east Queensland. However it has also invaded regions of central Queensland and is found as far north as Cairns and the Atherton Tablelands.

Potential distribution modelling suggests the possibility of significant range increases in Queensland if spread is not actively contained.

Control

Managing Madeira vine

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by Madeira vine. This fact sheet provides information and some options for controlling Madeira vine.

Management strategies

Successful management of Madeira vine requires exhaustion of the tuber bank. Tubers can remain viable for up to 15 years and can be easily spread through poor green waste management or via gravity and water movement from ridges and watersheds or during floods.

A management plan should be carefully designed and include a commitment to regular, long-term follow-up control. The disturbance caused by control work stimulates particularly vigorous vine growth and if management isn't carried out appropriately may lead to an even greater problem. Plan to:

1. Prevent Madeira vine spread

Identify isolated plants or sparse populations and control these first. Also consider the topography of the landscape and prioritise isolated infestations on high ground or at the top of catchments.

2. Reduce established infestations

Weed strategically, protecting the better quality native vegetation first e.g. treat Madeira vine infesting trees that are still living. Where possible, work from the edge of the infestation toward the core – the exception may be where you need to protect isolated areas of high biodiversity value.

3. Follow-up, rehabilitate and monitor

The size of the area targeted at each stage should be manageable enough to enable thorough follow-up control two to three times a year. Ensure activities do not spread the tubers.

Monitor the site to ensure effective native plant regeneration (highly degraded sites may require active replanting) and early detection of invasion by other weed species.

Physical control

Physical control of Madeira vine is difficult because of the extent of underground tubers and ease of fragmentation of the vine and root system. However, it may be practical for smaller or immature infestation sites or as a follow-up to remove persistent tubers.

Cutting and pulling the vines from the canopy is not generally recommended because it results in a rain of viable tubers and may be dangerous if dead and dying branches are pulled down with the vine. However, this may be necessary where there is extreme stress on the host plant. In this case, tarpaulins should first be laid on the ground to collect as many of the aerial tubers as possible.

Tubers and vegetative material must be disposed of appropriately as they will shoot in contact with moist soil. Ideally tubers and vines should be composted on-site to reduce the risk of further spread. Compost sites should be established away from other vegetation where they can be easily and frequently foliar sprayed. Alternately, double bag the plants and tubers in non-biodegradable plastic bags and dispose of them in landfill waste. **Do not** dispose of Madeira vine in council green waste bins as this may spread the weed.

Biological control

The leaf feeding beetle *Plectonycha correntina* was first released in Queensland in 2011. Both the adult and larval stages feed on the leaves of Madeira vine and it is expected that large reductions in leaf area will reduce the plant's ability to produce energy and cause it to deplete the resources stored in its tubers. Significant defoliation should also promote canopy recovery in host plants. Releases of the insect have occurred in New South Wales and Queensland and at many of these sites the beetle has established and significant leaf feeding damage has been observed.

Herbicide control

Herbicides can be effective if they are carefully chosen and selectively applied. The main application techniques are scrape and paint and foliar spray, although basal barking and cut stump are also used.

A range of selective, non-selective; residual and non-residual herbicides are available for spot spraying Madeira vine regrowth and seedlings. There are pros and cons associated with each of these that must be considered on a site by site basis:

Non-selective and non-residual herbicides

These are herbicides like glyphosate which will affect most plant species they come in contact with but don't remain active in the soil. In most instances glyphosate is the preferred herbicide for madeira vine management because there are few restrictions on who can use it and where it can be used (frog friendly versions like Roundup® Biactive are available for areas adjacent to waterways). However, care must be taken to avoid contact with desirable species as in-discriminate spraying will open up bare ground for opportunistic weed invasion.

Selective and residual herbicides

Residual herbicides are more effective at controlling Madeira vine tubers – enabling more rapid management of infestations; and selective herbicides, if used correctly, allow non-susceptible species to persist, providing competition to future weed invasion.

For example, research indicates that foliar sprays of triclopyr (300 g/L) + picloram (100 g/L) + aminopyralid (e.g. Grazon Extra®), even at sub-label mix rates of 20–40 mL/10 L of water is particularly effective for the management of regrowth, juveniles and tubers. At these rates non-susceptible species like grasses, ferns, rushes and sedges should be unaffected. However, it may impact other woody plants and vines, particularly in the immature stages and the use these herbicides should be avoided at more sensitive sites. In degraded and heavily infested sites where native species recolonisation from adjacent areas or active revegetation will be required, these selective and residual herbicides should provide a better control option.

Application techniques

Scrape-paint application

This approach is suitable for medium to large basal stem sizes and provides the safest management option in sensitive environments. It is however extremely labour intensive as every vine must be treated individually.

Scrape 10–20 cm sections of the vine down to the white fibrous layer and immediately paint the exposed areas with concentrated herbicide (see Table 1 for recommended herbicides and rates). Repeat the process as high up the stem as can be reached, and where possible, scrape areas on both sides of the stem. Be careful not to ring bark the stem as this will halt the spread of the herbicide.

Foliar spray

Traditionally, foliar spray has been used as a secondary treatment to manage prostrate growth and seedlings once the primary stems have been treated using scrape and paint techniques. However, some practitioners now recommend the use of foliar spray as a stand alone treatment. This approach has been developed to increase the cost effectiveness of management but does carry the risk of off-target damage. Decisions on the applicability of this management approach should be made on a site-by-site basis, considering the vegetation composition and sensitivity of the site, as well as the skills of those applying the herbicide.

Handheld equipment (handgun and hose or knapsack) is useful to spot spray prostrate stems, seedlings and regrowth.

Some selective herbicides can be used to treat vines climbing over non-susceptible (or weedy) host plants; however extreme care must be taken.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of Madeira vine

Method	Herbicide	Rate	Registration status	Comments
Basal bark (scrape and paint)	Picloram 44.7 g/L + Aminopyralid 4.47 g/L (e.g. Vigilant II® herbicide gel)	Neat 3–5 mm layer of gel applied to scraped surface	Registered Australia wide (rhizomatous plants)	Appropriate for medium sized to well established vines with tubers Apply herbicide to scraped section of vine within 15 seconds
	Glyphosate 360 g/L (e.g. Ken-up Aqautic 360, Roundup® Biactive, Weedmaster Duo®)	667 mL/1 L water (1:1.5)	PERMIT 11463 (expires 30/06/2023)	
Basal bark	Fluroxypyr[S] 333 g/L (e.g. Starane Advanced®)	21 mL/1 L diesel/kerosene	Registered	Appropriate for medium sized to well established vines with tubers Always treat vines away from the host tree
	Fluroxypyr[S] 200 g/L (e.g. Flagship® 200, FMC Fluroxypyr 200 Herbicide)	35 mL/1 L diesel	PERMIT 11463 (expires 30/06/2023)	
Cut stump	Picloram[R] 44.7 g/L + Aminopyralid 4.47 g/L (e.g. Vigilant II® herbicide gel)	Neat 3–5mm layer of gel applied to scraped surface	Registered (rhizomatous plants)	Appropriate for young vines without aerial tubers; or vines with immature tubers Only use for mature vines where prompt follow-up treatment of new growth arising from fallen tubers is possible Where possible, apply in spring before new tubers proliferate Apply herbicide to the cut surface of stem within 15 seconds
	Glyphosate 360 g/L (e.g. Ken-up Aquatic 360, Weedmaster Duo®)	500 mL/1 L water (1:2)	PERMIT 11463 (expires 30/06/2023)	
Foliar application	Fluroxypyr[S] 200 g/L (e.g. Flagship® 200, FMC Fluroxypyr 200 Herbicide)	50 mL/10 L water	Registered	Appropriate for madeira vine treatment in disturbed areas of native vegetation or spot spraying of seedlings and prostrate growth Apply to healthy actively growing vines only Apply only when supporting plant and understory is dead or weedy Apply early autumn (March–April) Do not spray beyond the point of runoff
	Fluroxypyr[S] 333 g/L (e.g. Starane Advanced®)	21 mL/10 L water		
	Fluroxypyr[S] 400 g/L (e.g. Nufarm Comet 400, Decoy 400)	25 mL/10 L water		
	Glyphosate 360 g/L (e.g. Ken-up Aquatic 360, Weedmaster Duo®)	100 mL/10 L water	PERMIT 11463 (expires 30/06/2023)	
	Metsulfuron-methyl[SR] 600 g/kg (Associate, Ken-Met 600)	1–5 g/10 L water + non-ionic surfactant	PERMIT 82307 (expires 31/03/2022)	
	Glyphosate 360 g/L + Metsulfuron-methyl[SR] 600 g/kg	200 mL Glyphosate + 1.5 g Metsulfuron-methyl /10 L water		
	Triclopyr 300 g/L + Picloram 100 g/L +/- Aminopyralid 8 g/L[SR] (e.g. Grazon Extra®) or Triclopyr 300 g/L + Picloram 100 g/L (e.g Farmoz Fightback®, Nufarm Conqueror®)	35–50 mL/10 L water	PERMIT 11463 (expires 30/06/2023)	

[S]Selective herbicide
[R]Residual herbicide
Prior to using the herbicides listed under PER11463 (expires 30/06/2023) you must read or have read to you and understand the conditions of the permit. To obtain a copy of this permit visit apvma.gov.au

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Groundsel bush

Baccharis halimifolia

Groundsel bush rapidly colonises disturbed areas, especially overgrazed pastures. It competes with pasture species for water and nutrients. Groundsel bush spreads rapidly from windborne seed, making clearing groundsel bush from paddocks a very time-consuming and expensive task.

In native *Melaleuca* wetlands, groundsel bush can form a dense understorey, suppressing growth of native sedges and interfering with the natural ecosystem.

Groundsel bush can become abundant in the vegetation along watercourses and in coastal woodlands and forest areas if not controlled.

The wind-dispersed seed can be a nuisance in urban areas where it sticks to insect screens and germinates in home gardens. Urban problems include potential allergies caused by airborne pollen and seed 'fluff'.

Legal requirements

Groundsel bush is a caegory 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

Queensland Government

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Groundsel bush is a densely branched shrub usually no more than 3 m high. Stems are green, maturing to brown and woody. Bark of mature plants is deeply fissured. Leaves are dull green, alternate, wedge shaped, 2.5–5 cm long and 1–2.5 cm wide, with a few lobes in the upper part. It has a deep branching taproot with numerous fibrous laterals in the upper soil.

Male and female flowers are borne on separate plants. Male flowers are pale yellow and open around mid to late March, slightly earlier than the female flowers. Female flowers are white and inconspicuous at the end of branches until seeds are fully developed.

Life cycle

Female plants flower around late March to early April and once pollinated develop a fluffy appearance, with tufts of white hair that begin to blow the fluffy seeds in the breeze from mid to late April. Most germination occurs in the autumn/winter period.

Plants normally do not flower in the first year of growth. Plants that are 2 m tall can produce from 500 000 to a million seeds.

Seeds from mature plants drift in the breeze like thistle seeds, most falling within a few metres of the parent bush. Wind updrafts can carry seeds many kilometres.

Seeds germinate readily with rainfall; however, if they become buried they can remain dormant for several years.

Methods of spread

Seeds are readily transported by wind, running water, vehicles and machinery. Soil disturbance in infested areas usually leads to substantial germination. Further infestation occurs unless the ground is sown to pasture or other competitive ground cover.

Habitat and distribution

Groundsel bush is a native of Florida (United States) and coastal areas adjacent to the eastern side of the Gulf of Mexico.

It was introduced into the Brisbane region as an ornamental plant in 1900 and has spread along the coastal areas of south-east Queensland (north to Miriam Vale) and down the New South Wales coast. Scattered plants have occurred as far west as the Chinchilla region.

Groundsel bush is a rapid coloniser of cleared, unused land and is particularly suited to moist gullies, salt marsh areas and wetlands. It also does well on high, cleared slopes.

Control

Managing groundsel bush

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by groundsel bush. This fact sheet provides information and some options for controlling groundsel bush.

Pasture management

In grazing situations, good pasture management will greatly reduce groundsel bush invasions. Slashing, timely use of fertiliser and management of stocking rates can assist in control by maintaining a healthy pasture. Good pastures provide competition to limit re-invasion of groundsel bushes. Consult pasture agronomists on the best options for your property.

For tall, dense infestations, burning can reduce the amount of above-ground material (and even kill the odd plant) making it a lot easier to spray regrowth. Annual burning does not reduce existing plant numbers, but allows grasses to establish more quickly and out-compete groundsel bush seedlings.

Regular slashing over a period of several years will result in a decreased level of infestation. In non-grazing situations, reforestation will eventually assist in control of groundsel bush. However, it is important to ensure that seed production is prevented while trees are establishing.

Mechanical control

Hand-pull small plants. Dig larger plants out or cut them off more than 10 cm below ground level.

As groundsel bush is a perennial woody plant with underground growing buds, slashing or burning will rarely kill plants and such action will generally result in regrowth occurring. Therefore the regrowth will need to be promptly controlled.

Biological control

Since the biological control program began for groundsel bush in 1967, over 35 different insects have been tested but only six have become permanently established in the field:

1. Stem borer (*Megacyllene mellyi*)
   This beetle is restricted to areas adjacent to salt marshes where the sap flow in the host plant is lower. Newly hatched larvae are drowned by the heavier sap flow in plants growing in non-saline soils. Dense populations of this insect can reduce groundsel bush infestations in suitable habitats.
2. Plume moth (*Oidaematophorus balanotes*)
   This insect is present in all areas. Damage is caused by larvae tunnelling in the stems and varies from severe dieback to death of individual branches. Populations of the moth appear to be restricted by ant predation on the eggs and young larvae. This in turn restricts plant damage.
3. Gall-fly (*Rhopalomyia californica*)
   The larvae of this mosquito-like fly feed within development shoots and buds. Initially this insect caused heavy damage when it was released. However, soon after its release it was attacked by a small native

wasp that drastically reduced gall numbers. Galls can always be found in low numbers, but occasionally higher numbers are found in patches. Overall damage to the plant is minimal.

4. Groundsel bush leaf beetle (*Trirhabda baccharidis*)
   This beetle is restricted to similar habitats to the stem borer, where the larvae can form suitable cocoons and pupate in the soil. Plants will be totally defoliated in autumn, but can recover and are in full leaf next spring. In some years larvae severely damage the buds and flowers.
5. Leaf skeletoniser (*Aristotelia ivae*)
   The larvae of this moth eat the soft leaf tissue leaving the skeletal woody veins. Though widespread, populations do not become large enough to cause significant damage. It is most commonly found in the spring on new leaves.
6. Leaf miner (*Buccalatrix iveila*)
   The larvae of this small moth mine in the leaf blades and later skeletonise the leaves in a manner similar to *Aristotelia*. This insect is widespread within the range of groundsel bush and causes minor damage.

Research has seen a move away from insect biocontrol to plant disease biological control agents. Two diseases have been studied in Florida. Experimental field releases of the rust fungus *Puccinia evadens* from Florida commenced in 1998 and this pathogen is now established at several sites.

Groundsel bush rust (*Puccinia evadens*) acts as both a leaf and stem parasite, causing defoliation during summer and winter and stem dieback over summer. The infection process requires a moisture film on the leaf or stem surface. The dry spores are spread by wind.

The presence of these biocontrol agents does not relieve landholders from their responsibility under Queensland legislation to manage the biosecurity risks associated with this invasive plant.

Herbicide control

Before using any herbicide, always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label. Table 1 details the herbicides for groundsel bush control.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of groundsel bush

Situation	Herbicide	Rate	Comments[1, 2, 3]
Pastures, non-agricultural, commercial, industrial land and rights-of-way	2,4-D amine 625 g/L (e.g. Ken-Amine 625)	2.9–4 L/ha 220 mL/100 L water 240 mL/15 L	Aerial application—higher rate for bushes Spray when actively growing High volume foliar spray Misting. Lightly wet plants
Pastures and non-agricultural land	2,4-D acid 300 g/L (e.g. Affray 300)	10 L/ha 33 mL/1 L kerosene or mineral turpentine 100 mL/10 L water 1 L/10 L water 0.37 L/ha	Helicopter spraying Basal bark or cut stump Knapsack foliar spray Sprinkler spray—1 L/100 m2
Pastures, rights-of-way and industrial land	2,4-D as sodium salt 700 g/kg (e.g. Tornado DF)	275 g/100 L water	High volume spot spray Addition of a surfactant is recommended (consult label)
Irrigation channels/banks, non-agricultural, commercial, industrial land, home gardens, pastures, rights-of-way and forests	Glyphosate4—IPA 360 g/L (e.g. Roundup Biactive)	700 mL – 1 L/100 L water 100–150 mL/15 L water 1:9 (2 x 2 mL dose per 0.5 m bush height)	Handgun—high rate in winter Knapsack foliar spray Splatter gun foliar spray
Commercial, industrial land, pastures and rights-of-way	Picloram + 2,4-D 75 g + 300 g (e.g. Tordon 75-D®)	0.65 L/100 L	Spot spray
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror[5]) Triclopyr 300 g/L + Picloram 100 g/L + aminopyralid 8 g/L (e.g. Grazon Extra[5])	250–350 mL/100 L 30 mL/15 L	Foliar spray Handgun Knapsack Use lower rate for plants 1–1.5 m tall in spring to summer, higher rate plants over 1.5 m or autumn treatment
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Basal bark or cut stump
Recreational, commercial, industrial land, pastures, rights-of-way and forests	Triclopyr 600 g/L (e.g. Garlon 600®)	160–320 mL/100 L water 500 mL/60 L diesel	Foliar spray Lower rate for seedlings and plants to 2 m, higher rate for plants over 2 m Basal bark/cut stump
Home gardens, commercial situations and recreation areas	Triclopyr 50 g/L (e.g. Defender Blackberry Plus Tree Killer)	200 mL in 1 L kerosene or diesel	Basal bark, stem injection Refer to product label for details
Home gardens, parks, golf courses, factories and other similar situations	Triclopyr 60 g/L (e.g. Richgro Tree & Blackberry & Woody Weed Killer)	200 mL in 1.1 L kerosene or diesel	
Grass pasture	MCPA 340 g/L + Dicamba 80 g/L (e.g. Kamba M)	2.8–4 L/ha 0.19–0.27 L/100 L 60 mL/15 L	Broadacre (boom) spray Handgun Knapsack
Pastures, forests, rights-of-way and industrial situations	Clopyralid 300 g/L (e.g. Lontrel®) Clopyralid 600 g/L (e.g. Lontrel Advanced) Clopyralid 750 g/kg (e.g. Clomac)	330 or 500 mL/100 L 165–200 mL/100 L water 130 or 200 g/100 L water	Handgun Spray foliage when growth is active Use higher rate on plants over 2 m tall
Pastures	Tebuthiuron 200 g/kg (e.g. Graslan®)	1 gm/m^2	Hand application (restrictions on use apply)

The formulations of 2,4-D, clopyralid and glyphoste listed here are examples only. Other formulations are available and many include groundsel bush on the label, but the treatments listed may vary. Consult the product label for more informaiton.For users who rely on home garden packs, triclopyr is available in products containing 50 g/L (e.g. Yates Tree & Blackberry Killer, Amgrow Chemspray Tree & Blackberry Killer), 60 g/L (e.g. Richgro Tree & Blackberry & Woody Weed Killer) or 120 g/L (e.g. David Grays Blackberry & Tree Killer). Registered uses vary so users should consult labels carefully before proceeding and follow instructions closely.

Notes

[1] Pasture legumes are susceptible to these herbicides.
[2] Cut stump treatments—cut as close to ground as possible and apply mixture immediately (within 15 seconds).
[3] Basal bark treatments—paint/spray 25 cm band around base of each stem.
[4] Glyphosate will kill pasture species.
[5] Cannot be used in hazardous areas without a DAF permit.

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Cat's claw creeper

Macfadyena unguis-cati (L.) A.H.Gentry
(syn. *Dolichandra unguis-cati* (L.) L.Lohmann)

Cat's claw creeper is a native of tropical America and is an aggressive climber that was used as an ornamental in older-style Queensland gardens. This vine has the ability to completely smother native vegetation, even growing up over trees, and many bushland areas already have serious infestations of this weed. The vine has a vigorous root and tuber system, which adds to difficulties in controlling the weed.

Cat's claw creeper has been recognised as a Weed of National Significance due to its invasiveness and potential impacts.

Legal requirements

Cat's claw creeper is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

Queensland Government

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Cat's claw creeper is a vine with long slender stems. Older stems become very woody with time. Its leaves each have two leaflets, with a three-clawed tendril (the cat's claw) growing between them. It has large, bright yellow, bell-shaped flowers in spring. The vine bears very long, narrow and flat pods containing many papery seeds.

Life cycle

Seed capsules mature in late summer to autumn, approximately 8–10 months after flowering. Seed begins to drop in late May, with peaks in July and August. Seeds germinate best when not buried and will germinate readily in moist leaf litter. Although seed viability is low, seed production is high and some seeds produce multiple seedlings.

Established plants can reproduce vegetatively from tubers and creeping stems. Detached tubers and cuttings may re-sprout in moist conditions. Roots start to develop tubers in their second year and plants may be well established before they start to flower.

Methods of spread

Cat's claw creeper produces numerous seeds with papery wings that aid dispersal, particularly by water and wind. Tuberous roots also spread by floods and humans.

Habitat and distribution

Cat's claw creeper is native in Central and South America and the West Indies. It is widely naturalised around the world, occurring in southern Africa, south-eastern USA and Hawaii, Asia, the Pacific Islands, Republic of Cape Verde, Mascarene and recently in Europe. Cat's claw creeper grows in a range of soil types, but does not tolerate poorly drained soils. Plants are capable of surviving heavy frost but seed germination is reduced at low temperatures.

Cat's claw creeper prefers warm-temperate, tropical and sub-tropical areas. It can be found in gardens, over fences, along roadsides, waterways and in disturbed rainforests. It occurs in coastal and sub-coastal areas of south-eastern Queensland, and in central and northern Queensland.

Control

Managing cat's claw creeper

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by cat's claw creeper. This fact sheet provides information and some options for controlling cat's claw creeper.

Physical control

Use a pruning saw, machete or brush hook to cut all leads/stems up the trees. All above the cut will die, but regrowth will occur from the underground tubers.

Digging the tubers out is not practical in most cases. Don't allow the regrowth to reach host tree's canopy; if they get away you will have to re-cut them.

Herbicide control

The regrowth is best treated with a foliar spray. Glyphosate 360 (mixed at a rate of 83 mL to each 1 L of water) can be applied in a cut stump method. It is best done in pairs. Cut the lead as close to the ground as possible and spray/paint on the herbicide.

The glyphosate must be applied within 15 seconds of cutting—while the sap is running—to take the poison down into the roots and tubers. If not within 15 seconds, re-cut lower and try again.

Because of the multitude of tubers the herbicide tends to knock them down one at a time with new regrowth coming from the next tuber. Be prepared to continue control over the next five years.

PER13914 allows the use of products containing 300 g/L of triclopyr plus 100 g/L picloram with or without 8 g/L aminopyralid, subject to particular conditions that are set out in the permit.

The herbicides listed in the table that follows are permitted to be used in the listed situations. Before using any herbicide always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label and the conditions in the APVMA permit.

Biological control

Cat's claw creeper is currently a target for biological control. The tingid bug *Carvalhotingis visenda*, the moth *Hypocosmia pyrochroma* and a leaf-mining jewel beetle *Hylaeogena jureceki* have been released. The tingid is widely established in majority of release sites and cause visible effects in some areas.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of cat's claw creeper

Situation	Herbicide	Rate	Comments
Pasture, non-crop situation (PERMIT 10533)	Glyphosate 360 g/L (e.g. Weedmaster Duo)	10 mL/L water	Foliar application Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold (0–2 m high). High-volume (knapsack or handgun) spray to wet foliage, ensuring complete coverage over top growing terminals.
		83 mL/L water	Cut stump Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold. Cut vine close to ground and immediately wet stump surface thoroughly using splatter gun, spray, swab or brush. Remove any branches on the stump and treat any cut surface.
	Dicamba 500 g/L (e.g. Kamba 500)	4 mL/L water	Foliar application Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold (0–2 m high). High-volume (knapsack or handgun) spray to wet foliage, ensuring complete coverage over top growing terminals.
		33 mL/L water	Cut stump Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold. Cut vine close to ground and immediately wet stump surface thoroughly using splatter gun, spray, swab or brush. Remove any branches on the stump and treat any cut surface.
Non-agricultural areas, domestic and public service areas, commercial and industrial areas, bushland/ native forests, roadsides, rights-of-way, vacant lots, wastelands, wetlands, dunal and coastal areas	Fluroxypyr 200 g/L (e.g. FMC Fluroxypyr 200 Herbicide)	35 mL/L Diesel/kerosene	Basal bark spray (PERMIT 11463)
Riparian zones	Triclopyr 300 g/L plus picloram 100 g/L (e.g. Nufarm Conqueror)or Triclopyr 300 g/L plus Picloram 100 g/L plus Aminopyralid 8 g/L (e.g. Grazon Extra)	400 mL of product per 100 L water	Foliar spray. Avoid getting spray on leaves of host and do not spray within 5 m of a waterway. Other restrictions apply. (PERMIT 13914)

Persons who wish to prepare for use and/or use products for the purposes specified in APVMA permits PER11463 or PER10533 must read, or have read to them, the details and conditions of the permit. APVMA permit PER11463 expires on 30 June 2023 and PER10533 expires on 31 July 2028. Both are available from the APVMA website at apvma.gov.au

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Lantana

Lantana camara

Currently, lantana covers more than 5 million ha of subcoastal New South Wales to Far North Queensland. Small infestations of lantana have also been found in central west Queensland, the Northern Territory, Western Australia, South Australia and Victoria. Efforts are under way to control these.

Lantana is mainly spread by fruit-eating birds and mammals. It forms dense thickets that smother and kill native vegetation and are impenetrable to animals, people and vehicles.

Queensland Government

Research indicates more than 1400 native species are negatively affected by lantana invasion, including many endangered and threatened species. As lantana is a woody shrub that has thin, combustible canes, its presence can also create hotter bushfires, altering native vegetation communities and pastures.

Legal requirements

All lantana species (*Lantana camara* and *Lantana montevidensis*) are category 3 restricted invasive plants under the *Biosecurity Act 2014*. They must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Lantana camara is a heavily branched shrub that can grow in compact clumps, dense thickets or as a climbing vine.

The stems are square in cross section, with small, recurved prickles. Most leaves are about 6 cm long and are covered in fine hairs. They are bright green above, paler beneath and have round-toothed edges. Leaves grow opposite one another along the stem. When crushed the leaves produce a distinctive odour.

Flowers appear throughout most of the year in clustered, compact heads about 2.5 cm in diameter. Flower colours vary from pale cream to yellow, white, pink, orange and red. Lantana produces round, berry-like fruit that turn from glossy green to purplish-black when ripe.

Life cycle

Flowering and germination occurs all year round but peaks after summer rains. Several thousand seeds can be produced per square metre and these can remain viable for several years.

Research indicates some ornamental lantana varieties have the ability to set seed and can spread vegetatively. They also produce some viable pollen and have the potential to cross-pollinate with wild forms, creating new varieties that could naturalise in the environment.

If the number of naturalised varieties increase due to genetic drift from ornamental varieties, it will make finding effective biological control agents even more difficult and potentially extend the climatic tolerances and range of the weed's spread.

Methods of spread

Spread mostly through the garden ornamental trade, by fruit eating birds and mammals.

Lantana camara can also spread via a process known as layering, where horizontal stems take root when they are in contact with moist soil. It will also reshoot from the base of vertical stems.

Habitat and distribution

Lantana camara is native to the tropical and subtropical regions of North, Central and South America.

Lantana camara is found throughout most coastal and subcoastal areas of eastern Australia, from the Torres Strait islands to southern New South Wales. It grows in a wide variety of habitats, from exposed dry hillsides to wet, heavily shaded gullies.

Toxicity

Many lantana varieties are poisonous to stock. It is difficult to tell which varieties are toxic so it is better to treat all forms as potentially poisonous. The toxins in lantana include the triterpene acids, lantadene A (rehmannic acid), lantadene B, and their reduced forms.

Most cases of lantana poisoning occur when new stock are introduced into lantana-infested areas. Stock bred on lantana-infested country avoid lantana unless forced to eat it due to lack of other fodder. Young animals introduced to lantana areas are most at risk.

Symptoms of lantana poisoning depend on the quantity and type of lantana consumed and, under some circumstances, the intensity of light to which the animals are exposed.

Early symptoms of depression are noticeable, with head swaying, loss of appetite, constipation and frequent urination. After a day or two the eyes and the skin of the nose and mouth start yellowing with jaundice, and the muzzle becomes dry and warm. The eyes may become inflamed and have a slight discharge. The animal also becomes increasingly sensitive to light. Finally, the muzzle becomes inflamed, moist and very painful ('pink nose'). Areas of skin may peel and slough off. Death commonly occurs 1–4 weeks after symptoms occur. Death from acute poisoning can occur 3–4 days after eating the plant.

If animals show any of the early symptoms, they should be moved to lantana-free areas, kept in the shade and monitored. Veterinary treatment should be sought immediately. Some remedies may include intravenous fluids, treating skin damage with antibiotics, or drenching with an activated charcoal slurry.

Care should be taken when introducing new or young animals into a paddock if lantana is present. Ensure they have enough fodder to stop them eating lantana in quantities sufficient to result in poisoning. During drought, animals should not be placed in lantana-infested areas without alternative food.

Control

Managing *Lantana camara*

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by *Lantana camara*. This fact sheet provides information and some options for controlling *Lantana camara*.

A general principle is to commence control programs in areas of light infestations and work towards the denser infestations using a mix (integration) of control methods gives the best results. Size, density and geographic location of infestations are important considerations for choosing which mix of control methods to use.

For large lantana infestations, treatment with herbicides by foliar spraying is usually not economically feasible. However, fire, dozing/stick raking, slashing/cutting, aerial helicopter spraying can reduce dense infestations, making follow-up spot treatments with chemicals more economically viable.

Lantana camara seed banks remain viable for at *least* four years, so follow-up control to kill seedlings before they mature is vital to ensure initial management efforts to control the parent bush are not wasted.

Appropriate fire regimes may become part of a management program to ensure *Lantana camara* invasiveness is reduced and pasture is maintained.

Removal of *Lantana camara* within areas of remnant vegetation may require a permit under the *Vegetation Management Act 1999*. Further information should be sought from the Department of Natural Resources and Mines before works commence.

Mechanical control

Stick raking or ploughing can be effective in removing standing plants. However, regrowth from stumps and/or increased seedling germination in disturbed soil is common and the site will require follow-up treatment.

Grubbing of small infestations—for example, along fence lines—can be a useful and effective method of removing plants, although this is time consuming.

Repeated slashing can also reduce the vigour of lantana, exhausting its stored resources and reducing its likelihood of re-shooting.

Some locations—for example, very steep inclines or gullies—are not suitable for mechanical control options because of the danger of overturning machinery and soil erosion.

Fire

Regular burning will reduce the capacity of plants to survive; however, initial kill rates are variable.

The effectiveness of this method will depend on the suitability of available fuel loads, fire intensity, temperature, relative humidity, soil moisture and season.

Pasture re-establishment can then provide competition to inhibit lantana seed germination. Fire is not recommended in non–fire tolerant vegetated areas such as rainforest, or wooded or plantation areas.

A typical control program for fire may include:

- exclude stock to establish a pasture fuel load
- burning (may require a permit)
- sow improved pastures—consult your local Biosecurity Queensland officer for advice
- continue to exclude stock until pasture has established and seeded
- burn again in summer before rain and spot spray *Lantana camara* regrowth when › 0.5 m high and when it is actively growing (see Table 1).

Biological control

Since 1914, 32 biological control agents have been introduced into Australia in an attempt to control lantana. Eighteen have established, of which several insect species cause seasonal damage, reducing the vigour and competitiveness of lantana in some areas.

Biosecurity Queensland research programs continue to investigate agents suitable for release in Australia, and test the viability of these agents in an effort to identify more effective biological control agents.

It is important to remember that biological control alone should not be relied upon for managing lantana infestations. Consideration should be given to other available control techniques.

The four most important biological control agents are:

- **sap-sucking bug (*Teleonemia scrupulosa*)**
  Found in dry areas from Cooktown to Wollongong, this small, mottled, bug feeds on the underside of leaves, growing tips and flower buds, causing the leaves to drop early and stopping the plant from flowering.
- **leaf-mining beetle (*Uroplata girardi*)**
  Found in most lantana infestations from Cape Tribulation to Sydney as well as around Darwin, except in very dry or high altitude areas. The adult beetles are dark brown. They shelter in curled leaves and feed on the upper leaf surfaces. Larvae feed in leaves causing blotches to spread across the leaf. This beetle reduces plant vigour and can suppress flowering.
- **leaf-mining beetle (*Octotoma scabripennis*)**
  Found in most lantana infestations from Atherton to Wollongong. Adults of this species feed on the upper leaf surface, while larvae feed and mine the centre of the leaf and cause blotches. This activity reduces plant vigour and can suppress flowering.
- **seed-feeding fly (*Ophiomyia lantanae*)**
  Found from Cape Tribulation to Eden in New South Wales and also around Darwin and Perth. *Ophiomyia* is a small black fly that feeds on flowers and lays eggs on the green fruits. The maggots of the fly eat the seed and make the fruit unattractive to birds, reducing seed spread.

Other agents such as *Aconophora compressa* (a stem-sucking bug) and *Leptobyrsa decora* (a sap-sucking bug) have caused some damage in specific geographic areas.

Note: Landholders are advised not to consume their time collecting established insects for distribution. Due to their own ability to disperse, these insects will be periodically/seasonally present in areas that are climatically suitable for them.

Herbicide control

Herbicide recommendations for lantana are shown in Table 1. Users of herbicides have a legal obligation to read herbicide labels and use only the registered rates.

Variation in results can be a result of inconsistent application methods, mix rates or seasonal variation. Red-flowered and pink-edged red-flowered lantana are often considered the most difficult to control because their leaves are often smaller and tougher. However, herbicides can kill these varieties if you carefully follow application procedures.

For single-stemmed lantana, basal bark spraying and cut stump methods also give good results at any time of year (but best when the plant is actively growing). On multi-stemmed varieties, you will obtain best results by carefully applying herbicide to each stem.

When treating actively growing plants less than 2 m high, overall spraying of foliage to the point of run-off is recommended. Splatter gun techniques are also effective and particularly useful in hard-to-access areas. This is best done in autumn—when sap flows draw the poison down into the root stock, but before night temperatures get too cold.

Remove grazing animals from spray areas during and soon after treatment. Stress can cause increased sugar levels in the leaves of lantana plants, making them more palatable.

Landholders and contractors should check if the property is situated in a hazardous area. This prevents the use of some herbicides, as defined in the *Agricultural Chemicals Distribution Control Act 1966*.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for control of *Lantana camara*

Situation	Herbicide	Rate	Optimum time[1]	Comments
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. Flagship 200)	500 mL to 1 L/100 L water	October to April	Thorough wetting of plants is required, higher rate should be used for larger plants.
	Fluroxypyr 333 g/L (e.g. Starane Advanced)	300–600 mL/100 L water		
	Fluroxypyr 400 g/L (e.g. Comet 400)	250–500 mL/100 L water		
Domestic areas, commerical, industrial and public service areas, agricultural non-crop areas, forests and rights-of-way	Glyphosate 360 g/L (e.g. Roundup Biactive, Glyphosate 360)	1 L/100 L water	October to April	Wet plant thoroughly. Glyphosate affects any green plant it comes into contact with. Glyphosate is available in a range of strengths. Consult labels for rates for other glyphosate formulations.
	Glyphosate 450 g/L (e.g. Glyder 450)	800 mL/100 L		
	Glyphosate 540 g/L (e.g. Roundup PowerMax)	660 mL/100 L		
	Glyphosate 700 g/kg (e.g. Macspred Dri 700)	500 g/100 L		
Agricultural non-crop areas, commercial and industrial areas, pastures and rights-of-way	2,4-D 300 g/L + Picloram 75 g/L (e.g. Tordon 75-D)	0.65 L/100 L water	March to May	Thoroughly wet foliage and soil around base of plant. Legumes are affected if sprayed.
Non-crop and rights-of-way	Dichlorprop 600 g/L (e.g. Lantana 600)	500 mL/100 L water	December to April	Must thoroughly wet all leaves. Please refer to product label for situation details.
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L + Picloram 100 g/L + aminopyralid 8 g/L (e.g. Grazon Extra®)	350 mL to 500 mL/ 100 L water	Summer to autumn	Wet plant thoroughly. Use the higher rate on plants over 1 m. Legumes may be affected if sprayed.
	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror)			
Pastures, rights-of-way and industrial	2 ,4-D amine 625 g/L (e.g. Ken-Amine 625)	320 mL/100 L water	March to May	Use a coarse spray with sufficient pressure to penetrate canopy and wet stems as well as foliage. Spray at the end of a wet Summer (March to May). Defoliation should occur but respraying of new growth will be necessary in following Autumn. Broadcast grass seed and keep stock off following Summer to allow the pasture to establish. Damage may result to pasture legumes. Red-flowered lantanas are more resistant to 2,4-D
	2 ,4-D amine 700 g/L (e.g. Amicide Advance 700)	285 mL/100 L water Consult label for other formulations of 2,4-D		
Native pastures, rights-of-way, commercial and industrial areas	Metsulfuron-methyl 600 g/kg (e.g. Associate, Lynx® 600)	10 g/100 L water plus wetter	March to May	Plants up to 2 m tall. Thoroughly wet all foliage and stems. Spray should penetrate throughout the bush. Addition of a wetting agent e.g. Pulse is recommended. Results variable. Not found effective in tropics. Follow-up sprays are necessary .
Native pastures, rights-of-way, commercial and industrial areas	Glyphosate 360 g/L (e.g. Weedmaster Duo, Glyphosate 360) plus Metsulfuron-methyl 600 g/L (e.g. Associate, Ken-Met 600) + tank mix	400 mL glyphosate 360 + 3 g metsulfuron/ 100 L water	March to May	Apply to actively growing bushes up to 2 m tall. Spray to thoroughly wet all foliage and stems. Spray to penetrate throughout the bush. Do not apply during periods of summer drought stress. Addition of a wetting agent e.g. Pulse is recommended
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 140 g/L + Aminopyralid 10 g/L (e.g. Hotshot)	500–700 mL /100 L water/100 L water	October to April	Apply to actively growing plants. Spray all foliage, including stems, to the point of run-off. Use the lower rate on seedlings and regrowth 0.5–1.2 m tall and the higher rate on plants 1.2–2 m tall.
	(i) Basal bark **(ii) Cut stump**			
	Triclopyr 600 g/L (e.g. Garlon 600)	1 L/60 L diesel	Any time Best results when actively growing	(i) Apply to lower 40 cm of every stem Must ensure complete coverage around stem (ii) Cut close to ground level Immediately apply herbicide
	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)			
	Picloram 44.7 g.L + Aminopyralid 4.47 g/L (e.g. Vigilant II® Herbicide Gel)	3–5 mm gel		(ii) If diameter of stump is › 20 mm, use a minimum of 5 mm gel thickness

Table 1. Herbicides for control of *Lantana camara* (continued)

Situation	Herbicide	Rate	Optimum time[1]	Comments
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Glyphosate 360 g/L (e.g. Roundup, Weedmaster Duo)	Undiluted	Any time Best results when actively growing	APVMA permit PER11463 (expires 30/06/2023) Prior to using the herbicides listed under PER11463 you must read or have read to you and understand the conditions of the permit To obtain a copy of this permit visit apvma.gov.au.
	Splatter gun			
	Glyphosate 360 g/L (e.g. Weedmaster Duo, Glyphosate 360)	1:9 glyphosate + water	October to April	2 x 2 mL dose per 0.5 m height of lantana. Addition of Pulse Penetrant may improve control.
	Metsulfuron methyl 600 g/L (Associate, Lynx® 600)	2 g/L water	March to May	
	Aerial			Follow label directions for equipment and other requirements for aerial application.
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L+ Picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (Grazon Extra)	10 L/ha	When actively growing	Helicopter only. Minimum of 200 L water per ha. Follow-up re-spray will be required. Do not burn within six months of treatment.
	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (Grazon Extra) + 2,4-D amine 625 g/L (e.g. Ken-Amine 625)	1.5 L + 6 L 2,4-D /ha	When actively growing	Helicopter only.Minimum of 200 L water per ha. Follow-up re-spray will be required. Do not burn within six months of treatment.
Non-crop and rights-of-way	Dichlorprop 600 g/L (e.g. Lantana 600)	6–8 L/ha	When plant actively growing	

[1]Optimum times are only a guide. *Lantana camara* must be actively growing for the herbicide to work.
Labels often recommend the additional use of a wetting agent or surfactant within the mix. Herbicides types vary in their selectivity against other species and soil residual.

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Broad-leaf privet

Ligustrum lucidum

Broad-leaf privet is a naturalised weed in South East Queensland; a potential invader of riparian vegetation and disturbed sites. In some coastal areas it displaces rainforest species. Broad-leaf privet is densely branched and can form thickets; destroying native animal habitat and disrupting their access through natural corridors. It is also recognised as a weed in South Africa and is known to cause significant irritations to sufferers of hay fever.

Legal requirements

Broad-leaf privet is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

Queensland Government

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Broad-leaf privet is an evergreen shrub up to 10 m tall. Branches are closely packed. Leaves are dark green, broad, leathery, 4–13 cm long, 3–6 cm wide, with pointed tips, growing in opposite pairs. Flowers are tubular, cream or white, 3.5–6 mm long, with sickly sweet fragrance. Berries are black, 9 mm long, 12 mm in diameter, occur in dense bunches. Each berry can contains two seeds. The seeds have a ribbed surface and are about 5 mm long.

Life cycle

Flowers in summer to produce clusters of black berries. The fruit is present during autumn and winter and with each berry containing two seeds, a tree can produce up to 10 million seeds annually. The seeds stay viable in the soil up to two years before germinating. A tree can live up to 100 years.

Methods of spread

Mostly spread by fruit eating birds. People have commonly cultivated it as a wind break or hedge. Fruit can float and be spread by water.

Habitat and distribution

Originally from Japan and China, tree privet is regularly seen in ornamental gardens throughout South East Queensland.

Broad-leaf privet prefers warm humid environments and it often found along creeks, gullies and drainage lines. Also a weed of open woodlands, grasslands, pastures, waste areas, disturbed sites, and roadsides.

Control

Managing broad-leaf privet

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by broadleaved pepper tree. This fact sheet provides information and some options for controlling broad-leaf privet.

Physical control

Broad-leaf privet seedlings may be controlled by mowing or hand-pulling. If removing by hand, take care not to break the taproot or regrowth is likely to occur.

Take care to ensure your own and others safety when trimming or lopping bamboo near power lines.

For electrical safety information visit worksafe.qld.gov.au/electricalsafety.

Herbicide control

Before using any herbicide always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of broad-leaf privet

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)	2 L product in 60 L diesel	Cut stump: plants with a basal diameter up to and in excess of 5 cm Apply immediately after the cut is made Basal bark spray: plants with a basal diameter up to 5 cm
	Triclopyr 600 g/L (e.g. Garlon 600)	1 L product in 12 L diesel	Cut stump: plants with a basal diameter up to and in excess of 10 cm Treat at any time of year Basal bark spray: only for plants with stem diameter less than 10 cm Treat at any time of year
Non-crop areas including native vegetation, conservation areas, gullies, reserves and parks	Picloram 43 g/kg + Aminopyralid 4.47 g/L (e.g. Vigilant II®)	Apply a layer of product 3–5 mm thick over cut surface	Cut stems no higher than 10 cm above ground level Stems greater than 20 mm in diameter, apply 5 mm thick. In multi-stem plants treat at least 80% of stems including all main stems
	Glyphosate 360 g/L (e.g. Roundup)	Use undiluted, apply 1–2 mL per 2 cm cut	Stem injection: up to 25 cm basal 1 mL per cut, 25–60 cm basal 1 mL per cut
		1 L product to 1 L water, 1:1 in water	Cut stump: 0–30 cm diameter cut close to ground and immediately wet stump surface
Native pastures, commercial and industrial areas and rights-of-way	Metsulfuron-methyl 600 g/kg (e.g. Associate)	10 g per 100 L water plus wetting agent	Foliar spray: apply to bushes up to 3 m high Complete spray coverage is essential DO NOT spray when plants are stressed
Non agricultural areas (native pastures), commercial and industrial areas and rights-of-way	Aminopyralid 375 g/kg + Metsulfuron-methyl 300 g/kg (e.g. Stinger)	20 g/100L water	Foliar spray: apply to plants up to 3 m high Complete foliar spray coverage is essential for control Partial spray coverage will result in regrowth recovery
Non agricultural areas (native pastures), commercial and industrial areas and rights-of-way	Aminopyralid 375 g/kg + Metsulfuron-methyl 300 g/kg (e.g. Stinger)	20 g/10 L water plus Pulse Penetrant (20 mL/10 L)	Low volume high concentration application techniques (gas gun) Apply to plants up to 3 m high Partial spray cover will result in regrowth recovery
Native pastures, rights-of-way, commercial and industrial areas	Triclopyr 75 g/L + Metsulfuron-methyl 28 g/L (e.g. Zelam Brush Weed)	250 mL/100 L water	Actively growing plants up to 3 m high Thorough coverage is essential for good control; partial coverage will result in regrowth Do not spray when bushes are stressed

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Common pest pear or prickly pear

Opuntia stricta

Common pest pear is an upright, drought tolerant shrub that rapdily invades pastures and natural areas and overwhelms native vegetation. Dense infestations can also impede access and reduce stock-carrying capacity.

It can also reduce land use and pastures. The spines can cause injury to stock, humans and native animals, reducing or preventing grazing activities and productivity.

Possession, propagation and distribution of common pest pear as an ornamental plant are not considered reasonable and practical measures to prevent or minimize the biosecurity risks posed by common pest pear.

In Queensland it is illegal to sell common pest pear on Gumtree, eBay, Facebook, at markets, nurseries or any marketplace.

Queensland Government

Legal requirements

Common pest pear is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to prevent or minimise the bioscurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

This spreading cactus grows up to 1.5 m high and forms large clumps. The stems are divided into oval, blue-green spineless pads 20 cm long and 10 cm wide. Areoles are in diagonal lines along the pads 2.5 cm to 5 cm apart and have a cushion of brown wool containing bristles but usually no spines. When spines occur they are stout, yellow and up to 4 cm long.

Flowers are up to 7.5 cm wide, bright lemon yellow, green at the base and sometimes have pinkish coloured markings on the outer petals. Immature fruit is green, oval-shaped, has a deep cavity on one end and tapers at the other. Fruit turns purple as it matures, 6 cm long and 3 cm wide, with carmine-coloured (dark red) seeds and a fleshy pulp. Seeds are 4–5 mm long, 4–4.5 mm wide and are generally yellow to pale brown in colour.

Life cycle

Common pest pear reproduces by seed and vegetatively via stem segments. Flowering occurs mostly during spring and summer.

Methods of spread

Common pest pear can spread by segments breaking off and attaching to animals, footwear, vehicles and machinery. The stem segments break off easily from the parent plant. These pads can survive long periods of drought before weather conditions allow them to set roots. It can also spread by floodwaters, and in some cases by being rolled along bare ground by strong winds.

Fruit are eaten by birds and other animals, and the seeds then spread in their droppings. The seeds have hard seed coats that allow them to survive heat and lack of water. People can also spread cacti for ornamental plantings.

Habitat and distribution

Native to southern United States of America, central America and northern South America, common pest pear has become invasive throughout Western Asia, Africa and Europe.

It is widespread throughout the eastern parts of Australia and also scattered throughout many other areas of the country. It is most abundant in central and southern Queensland and northern New South Wales.

Common pest pear prefers hot, semi-arid environments but also occurs in drier sub-tropical and warmer temperate regions. It can be found along roadsides, disturbed sites, pastures, open woodlands, forests, rangelands and grasslands.

Control

Managing common pest pear

The GBO requires a person to take reasonable and practical measures to minimise the biosecurity risks posed by common pest pear. This fact sheet provides information and some options for controlling common pest pear.

The best control for common pest pear incorporates integrated management strategies, including herbicides, mechanical, physical and biological control methods.

Physical control

Dig out plants completely and deep bury. Ploughing is not considered an effective means of control unless followed by annual cropping.

For advice on disposal options, contact your local government office or Biosecurity Queensland on 13 25 23.

Mechanical control

Mechanical control using machinery is difficult because prickly pear pads can easily re-establish.

Biological control

Common pest pear once covered vast areas of Queensland, until it was successfully controlled by the biological control agent in the late 1920s, *Cactoblastis cactorum*. Although common pest pear was not completely eradicated, the agent achieved an acceptable level of control.

Both the moth introduced 90 years ago and a more recent introduction of the cochineal bug, *Dactylopius opuntiae* have proven to be effective in reducing the fruiting and abundance of common pest pear. Once established on individual plants, the adults provide a continuous supply of new insects to attack new growth and surrounding plants. While the cactoblastis moth is an efficient flyer and can disperse itself, cochineal insects are wind-borne and may require some manual assistance for dispersal onto new plants.

How to distribute cochineal

Spreading cochineal insects involves the manual transfer of cochineal-infested segments onto more distant plants (>50 m away). For safe handling, use strong tongs and a knife to cut infested stem segments. Carry infested plant material in plastic tubs with lids. Don’t leave cochineal in direct sunlight or hot vehicles. Using tongs, the infested stem segments should be wedged or tied near new fresh segments on the receiving plant, so that the insect nymphs can crawl over to infest fresh plant segments.

Many other opuntioid cacti species are still incorrectly referred to as prickly pear. Some of these are controlled by different biological control agents – including different species of cochineal that all look very similar. For effective control, the correct biological control agent must be used for each species. Refer to factsheets for *Opuntia aurantiaca*, *Opuntia monacantha* and *Opuntia tomentosa* for further information about the biological agents that target those species.

Herbicide control

Herbicide options available for the control of common pest pear in Queensland are listed in Table 1.

Landholders and contractors should check if the property is in a hazardous area as defined in the *Agricultural Chemicals Distribution Control Act 1966* prior to spraying.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of common pest pear

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)	1 L/60 L diesel	Apply as an overall spray
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Aminopyralid 8 g/L + picloram 100 g/L + triclopyr 300 g/L (e.g. Grazon Extra)	500 mL/100 L of water	Foliar spray
	Picloram 100 g/L + triclopyr 300 g/L (e.g. Fightback)	500 mL/100 L of water	Foliar spray
	Triclopyr 600 g/L (e.g. Garlon)	3000mL/100 L of water	Foliar spray –slow acting
	Triclopyr 600 g/L (e.g. Garlon)	1330 mL/100 L of diesel distillate	Basal bark or cut stump Apply as a thorough foliar spray
Areas of native vegetation, bushland reserves and revegetation areas, non-crop areas and open public spaces	Glyphosate 360 g/L (e.g. Roundup Biactive)	1:1.5 with water to undiluted herbicide	Permit 82307 (expires 31/07/2022) Injection: drill, frill or axe
Non-agricultural areas, domestic and public service areas, commercial and industrial areas, bushland/native forests, roadsides, rights-of-way, vacant lots, wastelands, wetlands, dunal and coastal areas	Glyphosate 360 g/L (e.g. Roundup Biactive)	Neat	Permit 11463 (expires 30/06/2023) Drill, frill, axe or stem injection at 1 mL per 2 cm hole or cut
	Triclopyr 240 g/L + Picloram 120 g/L (e.g Access)	1 L/60 L diesel	Permit 11463 (expires 30/06/2023)
	Picloram 100 g/L + triclopyr 300 g/L (e.g. Fightback)	500 mL/100 L of water	Permit 11463 (expires 30/06/2023) Foliar spray
	Aminopyralid 8 g/L + picloram 100 g/L + triclopyr 300 g/L (e.g. Grazon Extra)	500 mL/100 L of water	Permit 11463 (expires 30/06/2023) Foliar spray

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

Placing a biological control infected stem segment

Pad infected by the biological agent cochineal bug

This fact sheet is developed with funding support from the Land Protection Fund.

Restricted invasive plant

Velvety tree pear

Opuntia tomentosa

Velvety tree pear is an upright, drought tolerant shrub that rapdily invades pastures and natural areas and overwhelms native vegetation. Dense infestations can also impede access and reduce stock-carrying capacity.

It can also reduce land use and pastures. The spines can cause injury to stock, humans and native animals, reducing or preventing grazing activities and productivity.

Possession, propagation and distribution of velvety tree pear as an ornamental plant are not considered reasonable and practical measures to prevent or minimise the biosecurity risks posed by velvety tree pear.

In Queensland, it is illegal to sell velvety tree pear on Gumtree, eBay, Facebook, Facebook Marketplace, at markets, nurseries or any marketplace.

Queensland Government

Legal requirements

Velvety tree pear is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to minimise and prevent the biosecurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

This tree-like plant forms a central woody trunk over 40 cm wide and grows up to 6 m high. The stems are divided into oblong pads that are dull green and velvety to touch due to the dense covering of short fine hairs. The pads are 15–35 cm long, 8–12 cm wide and 1.5–2 cm thick.

Young plants have 2–4 white or pale yellow spines located in the areoles with one spine reaching a length of 2.5 cm. The areoles usually become spineless as the plant matures. A more spiny variety does exist and has more than 50 spines in each areole on the trunk.

The flowers are a deep orange, 4–5 cm long and 4–5 cm wide. The fruit is green, turning to reddish-purple as they mature. They are egg-shaped, about 5 cm long and 3 cm wide, and dull red. The top of the fruit is saucer-shaped with circular lines that meet in the centre and give the fruit a shrivelled appearance. The fruit produces many seeds, 3–5 mm long within a reddish pulp.

Life cycle

Velvety tree pear reproduces by seed as well as stem fragments, fallen flowers and immature fruit. Flowering occurs mostly during spring and summer.

It can also spread by attaching to animals, footwear, vehicles and machinery. It can also spread in garden waste and by people growing as an ornamental plant.

Fruit are eaten by birds and other animals, and the seeds then spread in their droppings.

Methods of spread

Velvety tree pear can spread by segments breaking off and attaching to animals, footwear, vehicles and machinery. The stem segments break off easily from the parent plant. These pads can survive long periods of drought before weather conditions allow them to set roots. I can also spread by floodwaters, and in some cases by being rolled along bare ground by strong winds.

Fruit are eaten by birds and other animals, and the seeds then spread in their droppings. The seeds have hard seed coats that allow them to survive heat and lack of water.

Habitat and distribution

Native to Mexico and Guatemala, velvety tree pear is common around Goondiwindi and Warwick. It is also widespread throughout central and southern Queensland.

Velvety tree pear prefers hot, semi-arid environments but also occurs in drier sub-tropical and warmer temperate regions. It can be found along roadsides, railways, disturbed sites, pastures, open woodlands, rangelands and grasslands.

Control

Managing velvety tree pear

The GBO requires a person to take reasonable and practical measures to minimise the biosecurity risks posed by common tree pear. This fact sheet provides information and some options for controlling velvety tree pear.

The best control for velevety tree pear incorporates integrated management strategies, including herbicides, mechanical, physical and biological control methods.

Physical control

Dig out plants completely and deep bury. Ensure that all tubers that can grow are removed and destroyed. Ploughing is not considered an effective means of control unless followed by annual cropping.

For advice on disposal options, contact your local government office or Biosecurity Queensland on 13 25 23.

Mechanical control

Mechanical control using machinery is difficult because stem segments can easily re-establish.

Biological control

Velvety tree pear has been recognised as a pest in Queensland since the 1920's. It has been partially controlled since the late 1920's by the biological control agent, *Cactoblastis cactorum*. Both the cactoblastis moth introduced 90 years ago and a more recent introduction of the cochineal bug, *Dactylopius opuntiae* have proven to be effective in reducing the fruiting of velvety tree pear, and to reduce the abundance of seedlings and plants under 1 m in height.

While cactoblastis larvae and cochineal bug can kill young tree pear, they have little impact on large plants. Older tree pear pads and stems contain tough, fibrous material that the insects cannot penetrate.

Some evidence suggests that felling or pushing over large trees where there are nearby infestations of cochineal, is a way to increase the impact of the biological control agents.

The insects multiply in number when they are protected from the elements, forming a nursery that can spread to regrowth from cut stumps or pads in contact with the ground. Once established, the adults provide a continuous supply of new insects to attack new growth and surrounding plants. Cochineal insects are wind-borne and may require some manual assistance for dispersal onto new plants.

How to distribute cochineal

Spreading cochineal insects involves the manual transfer of cochineal-infested segments onto other plants. For safe handling, use strong tongs and a knife to cut infested stem segments. Carry infested plant material in plastic tubs with lids. Don't leave cochineal in direct sunlight or hot vehicles. Using tongs, the infested stem segments should be wedged or tied near new fresh segments on the receiving plant, so that the insect nymphs can crawl over to infest fresh plant segments.

Many opuntioid cacti species are incorrectly referred to as prickly pear, which is the common name for common tree pear *(Opuntia stricta*). Different opuntioid cacti are controlled by different biological control agents – including different species of cochineal that all look very similar. For effective control, the correct biological control agent must be used for each species.

Refer to factsheets for *Opuntia aurantiaca*, *Opuntia monacantha* and *Opuntia stricta* for further information about the biological agents that target these species.

Herbicide control

Herbicide options available for the control of velvety tree pear in Queensland are listed in Table 1.

Landholders and contractors should check if the property is in a hazardous area as defined in the *Agricultural Chemicals Distribution Control Act 1966* prior to spraying.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of velvety tree pear

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + Picloram 120 g/L (e.g Access)	1 L/60 L diesel	Apply as an overall spray
Non-crop areas around buildings, commercial and industrial areas, domestic and public service areas and rights-of-way	Amitrole 250 g/L + Ammonium thiocyanate 220 g/L (e.g. Amitrole T)	4000 mL/100 L of water	Foliar spray
	Amitrole 250 g/L + Ammonium thiocyanate 220 g/L (e.g. Amitrole T)	Neat	Stem inject 1 mL injected into cuts at 3 cm spacing
Areas of native vegetation, bushland reserves and revegetation areas, non-crop areas and open public spaces	Glyphosate 360 g/L	1:1.5 with water to undiluted herbicide	Permit 82307 (expires 31/07/2022) Injection: drill, frill or axe
Non-agricultural areas, domestic and public service areas, commercial and industrial areas, bushland/native forests, roadsides, rights-of-way, vacant lots, wastelands, wetlands, dunal and coastal areas	Glyphosate 360 g/L	Neat	Drill, frill, axe or stem injection at 1 mL per 2 cm hole or cut Permit 11463 (expires 30/06/2023)
	Triclopyr 240 g/L + Picloram 120 g/L (e.g Access)	1 L/60 L diesel	Permit 11463 (expires 30/06/2023)
	Picloram 100 g/L + triclopyr 300 g/L (eg fightback	500 mL/100 L of water	Foliar spray Permit 11463 (expires 30/06/2023)
	Aminopyralid 8 g/L + picloram 100 g/L + triclopyr 300 g/L (e.g. Grazon Extra)	500 mL/100 L of water	Foliar spray Permit 11463 (expires 30/06/2023)

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

Pad infected by the biological agent cochineal bug

Note the velvety appearance on the pad

This fact sheet is developed with funding support from the Land Protection Fund.

Rat's tail grasses

Sporobolus pyramidalis, S. natalensis, S. jacquemontii and *S. fertilis*

Rat's tail grasses are invasive grasses that can reduce pasture productivity, out-compete desirable pasture grasses and cause significant degradation of natural areas. They are often referred to as weedy *Sporobolus* grasses.

These species were originally introduced and trialled as pasture grasses and for soil conservation and have been unintentionally spread from these initial introductions and other accidental introductions as contaminants in pasture seed, fodder, on vehicles and machinery and in and on livestock. Rats tail grasses have now adapted well to large areas of northern, eastern and southern Australia. They have low palatability when mature, are difficult to control and can quickly dominate a pasture, especially following drought, overgrazing or soil disturbance. They can affect cattle health and productivity reducing weight gain and growth rates and weaning percentages and weights. These grasses are a significant threat to the broader environment given they are well adapted to Australia, difficult to control and form dense almost mono-specific stands where conditions allow.

Queensland Government

Four species of introduced Sporobolus grasses are invasive plants in Queensland:

- giant rat's tail grass *(Sporobolus pyramidalis and Sporobolus natalensis*)
- American rat's tail grass *(Sporobolus jacquemontii)*
- giant Parramatta grass *(Sporobolus fertilis).*

Legal requirements

Giant, American and giant Parramatta rat's tail grasses are category 3 restricted invasive plants under the *Biosecurity Act 2014*. A person must not release these invasive plants into the environment, give away or sell as a seed, plant or something infested with its seeds. The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description and distribution

Rat's tail grasses are robust, perennial tussock grasses growing up to 2 m high. They are difficult to distinguish from other pasture grasses before maturity. However, their leaves are noticeably tougher than those of any other species.

They can also be difficult to distinguish from native *Sporobolus* grasses; however, the native grasses tend to be shorter and softer and have less dense seed heads than giant rat's tail grass. The seeds of all species are indistinguishable in pasture seed samples using current identification techniques.

Giant rat's tail grass

Giant rat's tail grass grows up to 2 m high, with a seed head of up to 45 cm long and 3 cm wide. Seed head shape changes from a 'rat's tail' when young to an elongated pyramid shape at maturity. Unlike Parramatta grass and giant Parramatta grass, giant rat's tail grass does not develop 'sooty spike' on its seed heads.

Distribution: Coastal and sub-coastal areas from Cape York (Queensland) to the Central Coast of New South Wales including the Central Highlands of Queensland.

American rat's tail grass

American rat's tail grass grows to 50–75 cm tall, with a seed head of up to 25 cm long and 0.5–3 cm wide. Distribution: Coastal and sub-coastal areas from Cape York to South East Queensland.

Giant Parramatta grass

Giant Parramatta grass grows to 0.8–1.6 m tall, with a seed head of up to 50 cm long and 1–2 cm wide. The branches of the seed head are pressed against the axis and overlap, although lower ones generally spread at maturity. Distribution: Coastal and sub-coastal areas from Cape York to South Coast of New South Wales.

Life cycle and adaptation

Rat's tail grasses flower and seed in the frost-free period of the year, with the main seeding in summer/autumn.

They are prolific seed producers with seed production of 85,000 seeds per square metre recorded in dense stands of giant rat's tail grass in a single year. The viability of rat's tail grass seed is about 90% with a significant proportion of seed remaining viable for up to 10 years.

Rat's tail grasses are well adapted to a wide range of soils from low to high fertility, acid to alkaline and sandy to heavy clay soils in high and low rainfall locations. This includes the seasonally dry monsoonal tropics, wet and dry tropics, subtropical and temperate regions of Australia. They also tolerate saline soil conditions.

Methods of spread

Seeds spread by livestock in manure and on fur and hooves. It can also spread on the coat of invasive and native animals, in mud, hay, and untested pasture seed.

Vehicles and machinery are also important spreaders of seed. Rivers, watercourses and any fast-flowing water can also move significant amounts of seed over long distances particularly where there are low levels of ground cover.

Control

Managing rat's tail grasses

The GBO requires a person to take reasonable and practical steps to minimise the risk of spreading rat's tail grass seed and the establishment of new infestations. This fact sheet provides information to assist with minimizing spread and a summary of options for controlling rat's tail grasses.

Prevention and early detection

Maintain competitive pastures with high levels of ground cover as this reduces the risk of rat's tail grass establishment. Heavy grazing does not control rat's tail grasses —research indicates that continuous heavy grazing actually favours its spread.

When moving stock from infested areas into clean areas, spell the stock in yards or a small holding paddock for at least seven days to allow rat's tail grass seed to pass through the gut of the animal. Similarly, quarantine new stock in yards or small holding paddocks before releasing them into large paddocks to minimize the risk of rats tail grass seed spread and enable early detection and control of any rat's tail grass plants that establish. Move stock when there is no dew or rain, to decrease the amount of seed sticking to their coats (see Table 1).

Establish weed-free buffer strips along boundary and internal fences where necessary, drainage lines and roadsides to restrict the spread of rat's tail grasses. When practical, **regularly** controlling rats tail grasses in riparian zones will reduce the movement of seed by water and limit spread. Always clean machinery thoroughly after working in infested areas. Follow integrated control strategies using herbicides, pasture management practices that maintain high levels of ground cover and property hygiene practices that limit the risk of seed spread.

Consider the attributes of replacement pasture grasses when deciding what to sow. If possible, choose grasses that are:

- well adapted to local environmental conditions and soil types
- stoloniferous or rhizomatous in growth habit
- resistant to heavy grazing
- palatable and productive
- competitive all year (i.e. do not open up in late winter/spring)
- not inclined to decline as soil fertility decreases
- fast to establish.

If a sown pasture species does not contain most of these attributes, it is unlikely to be successful as part of a rat's tail grass control program.

Some pasture species, while providing strong competition once established, are weak competitors with rat's tail grasses in their early stages of establishment (e.g. Koronivia grass and Bisset creeping bluegrass). These grasses are most successful against rat's tail when sown with other grasses that are vigorous when young and provide early competition against rat's tail grasses (e.g. Rhodes grass).

Biological control

Biosecurity Queensland is investigating potential biological control agents. To date no agent has been approved for the control of rat's tail grasses.

Management strategies

Always commence control programs in areas of light infestation, and work towards the denser infestations.

If, after considering the management options set out below, you choose to use a herbicide option, ensure you apply all herbicides strictly according to the directions on the label and the directions of any Australian Pesticides and Veterinary Medicines Authority (APVMA) permit. You **must** read APVMA permit 9792 if you wish to prepare or use products for the control of rat's tail grasses in situations other than those specified on the product label.

Some herbicides permitted or registered for giant rat's tail grass control have withholding periods and significant ongoing management requirements in grazing and dairy farming. If you have or may have dairy or beef cattle on your property at any stage in the future, carefully consider these requirements when choosing herbicides for use on your property.

Some details of management options are provided below.

Scattered plants and light infestations

Choose **one** of the following options:

(a) spot spray with glyphosate
(b) spot spray with flupropanate
(c) use glyphosate through a pressurised wick wiper
(d) hand chip, bag and remove stools from the paddock and burn them.

Dense infestations on arable land

(a) Cropping option

First summer (early)

1. Boom spray with glyphosate as per label or permit directions and burn prior to ploughing.
2. Spot spray or hand chip fence lines, headlands, drainage lines, shelter belts etc. for weedy rat's tail grasses missed in cultivation. Plant a long-season forage sorghum variety using a recommended pre-emergent herbicide.
3. Spot spray or hand chip any surviving rat's tail grasses to prevent reseeding.

Second summer

1. Boom spray with glyphosate to control new seedlings and crop regrowth prior to cultivation.
2. Follow the same procedures and similar cropping as for the first summer.

Third summer

1. Boom spray with glyphosate to control crop regrowth and any rat's tail grass seedlings.
2. Plant paddocks with improved pastures using minimum tillage techniques to restrict bringing buried seed to the surface. Use a direct drill planter or surface broadcasting and rolling techniques. Plant fast-growing pasture grasses at triple the standard sowing rates to compete with rat's tail grass seedlings.
3. Fertilise the pasture for fast pasture establishment.
4. Spot spray or hand chip rat's tail grass seedlings.

(b) Pressurised wick wiper option

To be effective, this option requires three treatments over an 18-month period.

First treatment (midsummer)

1. Make sure there is a 30 cm height difference between rat's tail grasses and other pasture plants by selective grazing of the 'good' pasture.
2. Wick wipe rat's tail grass using glyphosate as per label or permit directions.
3. Graze using increased stocking rates after wick wiping.

Second treatment (late summer or autumn)

Wick wipe rat's tail grass using glyphosate as per label or permit directions.

Third treatment (next summer)

Wick wipe rat's tail grass using glyphosate as per label or permit directions.

Dense infestations on non-arable land

Choose **one** of the following options:

(a) In summer, apply glyphosate through a pressurised wick wiper (if terrain and timber allow).

(b) In summer, boom or blanket spray with glyphosate in split applications as per label or permit directions (see Table 2) and replant the pasture using fast-growing pasture grasses at double the standard sowing rates.

(c) In winter or spring, boom or blanket spray with flupropanate as per label or permit directions.

More information

For more information contact your local government or visit biosecurity.qld.gov.au.

Table 1. Best practices for management for rat's tail grass infestations

Dos	Don'ts
Cattle	
• Manage the grazing and stocking rate to maintain high levels of ground cover. • Where possible muster only in the afternoon when the dew has dried to minimise seed plants and seeds are dry. • Restrict cattle to a small paddock or a laneway free of rat's tail grasses with sufficient feed for seven days after grazing the rat's tail grass paddock to minimize seed spread in manure.	• Don't overgraze, as this will reduce ground cover to a low level which will promote rat's tail grass seedling emergence. • Where possible avoid mustering on wet days or when the soil is muddy. • Don't deliberately overstock paddocks infested with rat's tail grass as this generally promotes rats tail grass.
Machinery	
• Provide a specific hose-down tarmac/area to clean contaminated machinery. • Keep roadways, laneways, stock routes and machinery corridors free of rat's tail grass to minimise risk of seed movement by machinery/vehicles. • If necessary in rats tail grass infested areas operate machinery when plant material and soil are dry to minimise seed movement.	• Don't slash areas infested with rat's tail grasses unless slashing is part of an integrated control program. • Don't knowingly drive vehicles through rat's tail grass infestations as contaminated vehicles are a major source of seed spread.
General hygiene	
• Enclose specimens for identification in tied bags or closed containers while transporting to prevent seed spread.	• Don't drive around the farm with a loose suspected rat's tail grass specimen in the cabin or in the back of a vehicle as this spreads seed.
Pasture management	
• Maintain sown pasture vigour with a maintenance fertiliser program. • Use planting methods that minimise soil disturbance when planting legumes into an infested pasture. • Plant the recommended competitive pasture grasses suitable for your climate and soil type.	• Don't allow soil fertility run-down as this reduces the competitiveness of sown pasture species and favours rat's tail grass. • Don't renovate an infested pasture as soil disturbance will favour rats tail grasses. • Don't burn the pastures infested with rat's tail grasses unless burning is part of an integrated control program such as a wick wiping, pre-cropping pasture
Hay and pasture seed	
• Determine the origin of hay to ensure there is a minimal risk of contamination with rat's tail grasses. • Feed hay in a yard, feedlot or small holding paddock so any rats tail grass plants introduced in the hay can be readily detected and controlled. • Only purchase seed from a reputable seed merchant.	• Don't knowingly purchase hay or seed contaminated with rat's tail grass. • Don't buy seed without knowing its origin.
Control strategies	
• Choose the most suitable control strategy based on your situation and the rat's tail grass population before starting the job. • If dairy or beef cattle will be in the paddock at any time in the future, carefully consider the exclusion and withholding requirements of the herbicides and the long-term implications before commencing treatments. • If spot spraying with glyphosate, operate close enough to spray downwards on to the plant to limit off target damage. • Use low-pressure spraying equipment to reduce the risk of off target damage.	• Don't spot spray with glyphosate using a high-pressure gun from the cabin of a vehicle as this results in off target damage increasing the risk of rats tail grass establishment. • Don't overspray with glyphosate past the point of spray run-off.

Table 2. Herbicides for the control of rat's tail grasses

Situation	Application method	Herbicide[1]	Rate	Comments
Pasture, grazed woodlands and agricultural situations prior to sowing, tree and vine crops, lucerne and agricultural non-crop situations	Boom spraying	Glyphosate 360 g/L (e.g. Roundup Biactive, Weedmaster Duo)	6 L/ha	Follow up the first treatment with a later knockdown treatment such as herbicide or tillage
Wasteland, forest and conservation areas, margins of aquatic areas, roadsides and easements, rights-of-way, commercial and industrial areas and public service areas	Boom spraying Double knockdown split application		3 L/ha + 3 L/ha	
Pasture, grazed woodlands and agricultural situations prior to sowing, tree and vine crops, lucerne and agricultural non-crop situations Wasteland, forest and conservation areas, margins of aquatic areas, roadsides and easements, rights-of-way, domestic, commercial and industrial areas, turf, playing fields, golf courses, public service areas and areas surrounding agricultural buildings	Spot spraying		1 L per 100 L water	
	Double knockdown split application		1 L + 1 L per 100 L water	
	Wick wiping		3.3 L per 10 L water	
Pasture, grazed woodlands, agricultural non-crop situations	Boom spraying	Flupropanate 745 g/L (e.g Tussock, Taskforce)	1.5–2 L/ha	**Do not** use in channels, drains or watercourses **Do not** reseed treated areas until at least 100 mm of leaching rain has fallen **Do not** spray near desirable susceptible trees **Do not** apply above 3 L/ha to steeply sloping sites Allow 3–12 months for control, depending on weather conditions and growth stage of plant
Wasteland, forest and conservation areas, roadsides and easements, rights-of-way commercial and industrial areas	Suppression of seedlings in improved pasture		0.5–2 L/ha	
Pasture, grazed woodlands and agricultural non-crop situations	Spot spraying		200 mL per 100 L water	
Wasteland, forest and conservation areas, roadsides and easements, rights-of-way, commercial and industrial areas, golf courses, public service areas and areas surrounding agricultural buildings	Wick wiping		500 mL per 10 L water	

[1]Read APVMA permit PER9792 for rates for products containing glyphosate 450 g/L or glyphosate 540 g/L.

The herbicides in Table 2 are permitted under PER9792 (expires 30 November 2025). You **must** read the permit if you wish to prepare or use products for the control of rat's tail grasses in situations other than those specified on the product label. The permit is available on the APVMA website apvma.gov.au

Read the label carefully before use and always use the herbicide in accordance with the directions on the label.

Fact sheets are available from biosecurity.qld.gov.au. The control methods recommended should be used in accordance with the restrictions (federal and state legislation, and local government laws) directly or indirectly related to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, the department does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.

03/23

Athel pine

Tamarix aphylla

Although tamarisks have been planted to control erosion, this practice is now discouraged. (Photo: John Stretch)

- Also known as: athel tree
- This plant is a Weed of National Significance
- This plant must not be sold anywhere in NSW

Profile

How does this weed affect you?

Athel pine is one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts.

Athel pine forms dense stands along inland rivers. It consumes water more quickly than native plants, thereby reducing the number and quality of watering holes. It concentrates salt, which is excreted by its leaves. This makes the ground beneath athel pines more salty and excludes native pasture grasses and other salt-sensitive plants.

It can change river flow patterns and cause overland flooding and bank erosion.

Because they are drought tolerant and fire resistant, athel pines decrease the frequency of fires and alter vegetation structure.

Infestations reduce the cultural and aesthetic value of affected land and may impact on tourism in the region.

There are several other Tamarix species, all commonly known as tamarisks, that are weeds in Australia.

Where is it found?

Athel pine is classified as a 'sleeper' weed because it was present in Australia for some time before it became weedy. A native of northern Africa and Asia, it was first introduced into Whyalla, South Australia, in 1930 via California. Since then it has been extensively planted as shade and wind breaks and for erosion control around rural South Australia, New South Wales, Queensland, Western Australia, and the Barkly Tablelands and Alice Springs regions of the Northern Territory.

The worst infestations of athel pine occur along 600 km of the Finke River in Central Australia near Alice Springs. The explosion in its abundance and range is thought to have been caused by large floods in the 1970s and 1980s, which washed seeds and vegetation downstream and provided the moist conditions required for germination.

Other athel pine outbreaks have occurred throughout inland Australia since the 1990s at Starvation Lake and Tilcha Flow (SA), Burnett and Darling Downs regions (Qld) and Menindie Lakes (NSW). Infestations on the Gascoyne and Avon Rivers (WA) have recently been shown to include both athel pine (*Tamarix aphylla*) and another weedy tamarisk species *Tamarix parviflora*.

Based on climate, athel pine could potentially infest inland watercourses throughout Australia. A few infestations exist outside of the projected distribution, perhaps surviving on below-ground water resources.

How does it spread?

Athel pine can reproduce by dropping seeds or, more commonly, by revegetation of plant parts. Although athel pine seeds die quickly if not kept moist, they are easily dispersed by both wind and water and may also be spread by animals. A single tree can produce thousands of seeds every year. Its habit of making nearby soil saltier may be assisting its expansion because it thrives in saline conditions.

What does it look like?

Athel pine is a spreading tree to 15 m with pendulous, jointed branches. Immature trees have light grey trunks and stems. Mature trees have a thick, rough, dark grey to black bark, and grey-brown stems, and can be up to 1 m in diameter. The minute, dull green leaves superficially resemble pine tree 'needles'. However, athel pine is misleadingly named as it is a flowering plant, not closely related to true pine trees (conifers). Its small flowers are pinkish-white without stalks, growing on 30–40 mm long spikes from the ends of the previous year's branches. The fruit is bell shaped with a hairy tuft, and contains numerous small cylindrical seeds. The seeds have a tuft of fine hairs which assists wind dispersal. The trees have strong woody roots which penetrate and spread deeply throughout the soil.

Do not confuse athel pine with native she-oaks

Athel pines resemble native she-oaks (*Casuarina* and *Allocasuarina* species), which are found in similar locations. Although both have needle-like 'leaves', they may be distinguished by careful examination of the needles and fruit. The segments of she-oak needles are 5–10 mm long, whereas the segments on athel pine needles are only 1–2 mm long. The hard, woody she-oak fruit resembles a small pine cone, whereas athel pine fruit is tiny and bell shaped. Additionally, athel pine flowers (white–pink, growing at the end of stems) are conspicuous during the summer.

What type of environment does it grow in?

Athel pine is drought resistant and is well suited to arid and semi-arid rangelands. It is tolerant of saline and alkaline soils and, although it flourishes best in and around rivers, is not restricted to the riverine environment. It has escaped cultivation and become naturalised in all mainland states and territories except Victoria.

Acknowledgements

John Gavin (NT DIPE), Richard Carter (NSW Dept of Agriculture/Weeds CRC), Philip Maher (Qld DNRM), Damian Collopy, John Peirce and John Stretch (WA Dept of Agriculture), Les Tanner (North West Weeds County Council) and John Thorp (National Weeds Management Facilitator).

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- Weed futures: Determining current and future weed threats in Australia, Tamarix aphylla. Macquarie University. (http://www.weedfutures.net/species.php?id=1235)

Control

Preventing the further spread of athel pine is critical to the successful management of this problem. As part of the prevention of spread measures, the planting of athel pine for windbreaks, shade or erosion control is now actively discouraged. Weedy *Tamarix* species should not be imported or further planted, and alternative species should be used. Generally, a native *Casuarina* or *Allocasuarina* species will make a good alternative, especially for windbreaks. However, local council weed officers will provide advice.

Control athel pine near rivers

Athel pine in the upper catchments of rivers are the highest priority for control. Experience indicates that athel pine spreads fastest along waterways, especially when summer flooding aids the downstream dispersal of vegetative material and germination of seeds. Therefore, mature athel pines in the uppermost parts of catchments are the highest priority for eradication. Control can then focus on downstream infestations. The lowest priority for control are mature trees away from water.

Early control efforts

Athel pine was not formally recognised as a weed in Australia until the late 1980s when control attempts first examined its susceptibility to different herbicides and different application techniques. In the mid 1990s mechanical control was attempted on the Finke River, and since then integrated control methods using both mechanical and chemical means have been used to combat the spread of athel pine.

Remove seedlings by hand and mature trees mechanically

Seedlings can be easily removed by hand in sandy ground, and large trees can be removed by ripping and bulldozing, taking care to remove as much of the root system as possible. A large bulldozer is required if the trees are fully grown. If possible the area should be deep ripped to bring any root material to the surface and, where appropriate, a suitable pasture should be sown to outcompete any regrowth of athel pine. Otherwise, care shouldbe taken to reduce the amount of soil covering felled stems and exposed roots as they may re-shoot. Follow-up treatments will be required as some re-shooting is likely. Permits may be required to conduct mechanical control if native species will be affected.

Herbicides may be better suited where erosion is a problem

Herbicides may be used as part of the follow-up to initial mechanical control, and are preferred in sensitive environments (eg riverbanks) where mechanical control may damage non-target species and cause erosion and habitat loss. Herbicide control generally entails treating each stem separately. Registered herbicides can be applied in several different ways. Frilling, where small notches are cut into the bark until the white sapwood is reached and herbicide is injected immediately into the notches, has been used successfully in the Carnarvon area. There should be about 50 mm between notches, and drenching guns or veterinary syringes can be used to deliver herbicide into each notch. An alternative approach with larger stems is the cut-stump technique, where the main stem is cut off by chainsaw and the stump is immediately painted with herbicide. Care should be taken to reach as close to the roots as possible.

Smaller trees that have not developed rough bark can be treated by the basal bark technique, which involves soaking the circumference of the stem, to a height of 250 mm above soil level, with herbicide to the point of run-off. Very small stems can be snapped or cut, and herbicide applied to the stem. Foliar spray over the entire plant is effective on small trees (less than 2 m). However, the impacts on non-target species (both natives and crops) prevent this method being used in the Carnarvon area.

Herbicide options

WARNING - ALWAYS READ THE LABEL
Users of agricultural or veterinary chemical products must always read the label and any permit, before using

the product, and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from compliance with the directions on the label or the conditions of the permit by reason of any statement made or not made in this information. To view permits or product labels go to the Australian Pesticides and Veterinary Medicines Authority website www.apvma.gov.au

See Using herbicides (http://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control) for more information.

PERMIT 9907 Expires 31/03/2025
Fluroxypyr 200 g/L (Comet® 200 herbicide)
Rate: 35 mL per L diesel/kerosene
Comments: Basal bark
Withholding period: Do not graze failed crops and treated pastures or cut for stock feed for 7 days after application. See label for further information.
Herbicide group: 4 (previously group I), Disruptors of plant cell growth (Auxin mimics)
Resistance risk: Moderate

PERMIT 9907 Expires 31/03/2025
Fluroxypyr 333 g/L (Starane™ Advanced)
Rate: 21mL per L diesel/kerosene
Comments: Basal bark
Withholding period: Do not graze failed crops and treated pastures or cut for stock food for 7 days after application. See label for more information.
Herbicide group: 4 (previously group I), Disruptors of plant cell growth (Auxin mimics)
Resistance risk: Moderate

PERMIT 9907 Expires 31/03/2025
Glyphosate 360 g/L (Various products)
Rate: One part product to 1.5 parts water
Comments: Cut stump, drill, frill axe or injection
Withholding period: Nil.
Herbicide group: 9 (previously group M), Inhibition of 5-enolpyruvyl shikimate-3 phosphate synthase (EPSP inhibition)
Resistance risk: Moderate

PERMIT 9907 Expires 31/03/2025
Glyphosate 360 g/L with Metsulfuron-methyl 600 g/kg (Various products)
Rate: 1:1.5 (ratio glyphosate to water) plus 1 g metsulfuron to 1 L water
Comments: Stem injection
Withholding period: Nil.
Herbicide group: 9 (previously group M), Inhibition of 5-enolpyruvyl shikimate-3 phosphate synthase (EPSP inhibition)
Resistance risk: Moderate

Biosecurity duty

The content provided here is for information purposes only and is taken from the *Biosecurity Act 2015* and its subordinate legislation, and the Regional Strategic Weed Management Plans (published by each Local Land Services region in NSW). It describes the state and regional priorities for weeds in New South Wales, Australia.

Area	Duty
All of NSW	**General Biosecurity Duty** *All pest plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*
All of NSW	**Prohibition on certain dealings** *Must not be imported into the state, sold, bartered, exchanged or offered for sale.*
Central West	**Regional Recommended Measure** *Land managers should mitigate the risk of the plant being introduced to*

Area	Duty
	their land. Land managers should eradicate the plant from the land and keep the land free of the plant. A person should not deal with the plant, where dealings include but are not limited to buying, selling, growing, moving, carrying or releasing the plant. Notify local control authority if found.

Tamarix ramosissima, or salt cedar, is closely related to athel pine and is similar in appearance. (Photo: Colin G. Wilson)

Flower buds near Carnarvon, WA, in early February. (Photo: John Stretch)

Athel pine has infested hundreds of kilometres of the Finke River in central Australia. (Photo: Colin G. Wilson)

The segments of athel pine needles are only 1–2 mm long. (Photo: Les Tanner)

Flowers and fruit from Bingara, NSW, in February. (Photo: Les Tanner)

The drooping needles are superficially similar to native Casuarina and Allocasuarina species. (Photo: John Gavin)

Finke River athel pine infestation after blade ploughing. (Photo: John Gavin)

Athel pine was traditionally planted around homesteads for shade. (Photo: Les Tanner)

Reviewed 2023

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Appendix 1 Vehicle and machinery cleandown procedures

Vehicle and machinery cleandown procedures

Queensland Government

This publication was compiled by Biosecurity Queensland, part of the Department of Agriculture and Fisheries.

Contents

1 General information

An invasive plant is a plant species that has or is likely to have an adverse impact on a biosecurity consideration because of the introduction, spread or increase in population size of the species in an area.

Invasive plants cost Queensland more than $600 million annually in lost production, land degradation and control costs. The spread of invasive plants threatens our agricultural industries, environment and social amenity.

Invasive plant infestations in Queensland have resulted of poor vehicle and machinery cleanliness and maintenance.

Vehicles or machinery operating or moving through weed infestations can become contaminated with invasive plant seeds or other reproductive material. These seeds or reproductive material can then travel long distances on the vehicle or machinery to new locations.

Reproductive material can include any part of a plant that is capable of growing to become a new plant (e.g. a bulb, rhizome, a stolon, a tuber, a stem, leaf cuttings or stem or root fragments).

There is a real risk that these seeds or soil and mud containing the seeds will fall from contaminated or dirty machinery or vehicles in agricultural production or environmentally sensitive locations where an invasive plant infestation may become a long-term and costly problem for the land manager to remediate.

Clean down of vehicles and machinery reduces the risk of spreading invasive plants and soil borne pests and diseases.

These clean-down procedures have been developed to allow a consistent approach across Queensland to the cleaning of vehicles and machinery. These methods will help reduce the chance of spreading invasive plant seeds or other reproductive material when moving vehicles or machinery.

This document will also help those undertaking the cleaning and inspection of vehicles and machinery to understand their role in helping drivers and operators to discharge their obligations.

1.1 General Biosecurity Obligation

Under Queensland's *Biosecurity Act 2014*, all persons have an obligation to take reasonable and practical measures to prevent or minimise the biosecurity risks associated with their activities or dealings with the carriers of invasive plants.

A carrier is anything capable of moving biosecurity matter, such as invasive plant seeds, attached to, or contained in the thing from one place to another.

All types of vehicles and machinery are capable of being carriers of invasive plants.

A person (for example, the owners or operators of vehicles and machinery) may show that they have discharged their general biosecurity obligation by following these procedures to ensure that

their vehicles and machinery are as clean as practical of the seeds or other reproductive material of invasive plants.

A person may rely on another person to take the measures on their behalf, if the measures are undertaken with due diligence.

1.2 Mineral Resources Acts - Land Access Code

Under the Land Access Code, a resource authority holder must (if asked) provide a landholder with a copy of the clean-down record. There is no set format for a clean down record. In providing that record, a person may refer to this document to describe the measures taken to perform the clean down.

1.3 Training

All people responsible for cleaning down vehicles or machinery should have previously undertaken competency-based training and received a satisfactory assessment.

Competency-based training is provided by registered training organisations (RTO) through units such as AHCBIO201A—Inspect and clean machinery of plant, animal and soil material. After completing this training, a person will be able to perform the tasks outlined in Table 1.

Table 1. Competencies required for satisfactory clean-downs

Element	Performance criteria
Check machinery and support vehicles	1.1. Machinery and equipment are checked for contamination according to written guidelines and legislative requirements. 1.2. Machinery and support vehicles are made safe for checking, supported safely, with free moving parts pinned or supported as required. 1.3. Covers and guards removed safely. 1.4. All points identified in legislation or operating procedures are identified and inspected for contamination.
Clean machinery and equipment	2.1. Machinery is made safe for cleaning, supported safely, with free moving parts pinned or supported as required. 2.2. Correct equipment for cleaning selected. 2.3. Points listed in appropriate regulations, checklists or enterprise procedures are cleaned and checked. 2.4. Guards replaced safely and checked. 2.5. Areas on other equipment likely to accumulate contaminants identified, inspected and cleaned
Complete cleaning work	3.1. Waste materials are disposed of according to enterprise operating procedures and relevant legislative requirements. 3.2. Records of cleaning are recorded on appropriate forms according to enterprise policy and procedures

1.4 Possible sources of invasive plant contamination

- Heavy machinery (e.g. dozers, excavators, graders) may contain seeds in mud on the tracks, tyres or attached implements.

- Farm vehicles that have been used in infested paddocks (e.g. tractors four-wheel drives) may be contaminated via mud on the wheels, seeds trapped in radiators or seeds in cabin floor mats.

- Farm Implements such as slashers, ploughs, mulchers and post-hole diggers may be contaminated after being used in infested paddocks.

- Harvesting machinery and headers may collect weed seeds in augers, in bins and behind guards when harvesting crops that are infested with invasive plants.

- Wheeled loaders and other mining and construction equipment may contain contaminated mud.

- Cars, trucks and four-wheel drives that have driven off-road through weed infestations may catch weed seeds in the radiator, mud guards, tyres and underbody.

- Trucks that have transported livestock from infested areas may contain viable weed seeds (e.g. prickly acacia, giant rat's-tail grass) that have fallen from or been passed through stock

1.5 High-risk areas

Vehicles and machinery driven or operated in certain areas of Queensland have a higher risk of becoming contaminated with the reproductive material of invasive plants:

- Vehicles and machinery that have been used, driven or sourced from the Central Highlands are at greater risk of being contaminated with parthenium weed seeds.

- Coastal and subcoastal areas from the New South Wales border to Rockhampton, as well as areas near Moura, Mackay, Townsville, Ingham and Mareeba, contain current infestations of exotic giant rat's-tail grass.

To view distribution maps of all Queensland's invasive plants, visit daf.qld.gov.au. However, for detailed information, you should consult those who have specific local knowledge (e.g. landholders, local and state government officers).

1.6 Tips for reducing the risk of spread

- Avoid driving off-road in areas known to contain declared plants (e.g. giant rat's-tail grass, parthenium weed) or in other areas that present a risk of vehicle or machinery contamination.
- Do not drive through infested paddocks.
- Ensure clothing and footwear is free of soil and plant material before stepping into vehicles.
- Avoid driving or working in contaminated areas in wet or dewy conditions.
- Clean vehicles and machinery suspected of carrying soil or plant material.
- Begin work in clean areas or in areas with the least amount of infestation and work towards infested or high-density areas.
- Keep roads, laneways and buffer zones free of invasive plants.
- Where possible, work infested areas separately and clean down equipment thoroughly before moving to another area.
- Avoid slashing and other work in infested areas during peak seed production times.
- Secure loads (e.g. grain, fodder) if you suspect they contain weed seeds.

2 Clean-down and maintenance sites

2.1 Choosing a mobile or field clean-down site

Cleaning vehicles and machinery before moving them to a different area helps prevent the spread of invasive plants to adjoining land, other parts of the property and along roads. However, you should choose a clean-down site that will give the best possible results and should consult the landholder about its location.

- Consider the site's run-off. Ensure the site is away from watercourses and drains—this will help prevent the spread of invasive plants and will avoid grease and detergents polluting the water.
- Choose a relatively flat site to help prevent run-off and to ensure safety. However a slight slope or the use of railway sleepers may prevent waterlogging.
- Ensure the site can be easily identified, as it will need to be monitored for outbreaks in the following seasons, and notify the landholder/trustee of the land of this location.
- A painted post, distinguishing landmark or GPS recording will help identify the site
- If possible, choose a well-grassed area to reduce mud during cleaning. Also, grass will compete with any weed seeds that later germinate, limiting the spread of the weed.
- Choose a site close to the infested area to prevent further spread.
- Do not choose a site that lies across the property boundary (unless the infestation is also located on the adjoining property at similar or higher densities).
- If possible, conduct small clean-downs at the landholder's shed facilities (with permission) before leaving the property.

2.2 Public clean-down facilities

Throughout Queensland, clean-down facilities are available for public or industry use. They are provided for cleaning vehicles and machinery to prevent spread of invasive plants and should be used whenever possible, as they are equipped with grease and silt traps for environmental protection.

Some local governments have clean-down facilities (e.g. at saleyards or council depots) and some of these may be suitable for machinery and vehicles. You may need to seek permission before using these facilities. For further information or for permission to use these facilities, contact the relevant local government.

Some facilities contain high-pressure water and air compressors.

2.3 Choosing a maintenance site

- If possible, use a hard-surfaced area such as a gravel area beside the landholder's shed. Then work can be carried out easily, parts can be removed safely and the area can be monitored.
- If the maintenance work must be done in the field/paddock, mark the area for future monitoring and record its location. Remember that during maintenance, declared

plant reproductive material may fall off the machinery when guards etc. are removed, so monitoring is essential.

3 General clean-down procedures

3.1 Safety

Ensure all safety precautions are taken. Refer to the relevant sections of the operating manual of the vehicle or machinery for specific safety instructions before cleaning.

- Place the vehicle or machinery in a safe position. It should be stable and immobile.
- Stop the engine, apply the park brake, chock the wheels and lower all implements or secure/chock them if they need to be up for cleaning (e.g. the slasher).
- Ensure the area is free of obstructions and objects that may cause injury (e.g. logs, power lines).
- Have a qualified operator present if parts of the vehicle or machinery need to be moved during cleaning.
- Move the vehicle or machinery with caution.

3.2 General clean-down guidelines

The following points are general guidelines only. Please refer to the specific procedures later in this document for different types of vehicles and machinery.

- Examine the item to determine how much mud, soil and plant material has built up.
- Identify any areas that require special attention as outlined in the specific vehicle or machinery procedures (e.g. radiators, spare tyres, behind guards and protective plates). Some of these may be difficult to locate and access. Remove the necessary guards or belly plates to access these areas for cleaning.
- Identify any areas that must be cleaned with compressed air rather than water. Clean these first.
- Where possible clean from the top down
- Clean upper body and cabin then under the guards and underneath the machinery/vehicle and then do the attachments or implements.
- Clean all toolboxes and storage compartments.
- Check that all areas have been cleaned.
- Replace the guards. (Remember that belly plates and other guards on heavy machinery may need to be replaced before moving the machinery.)
- Move the clean vehicle or machinery carefully, avoiding recontamination. If necessary, wash any remaining mud, soil or plant material from the tyres or tracks.
- Record the details of the cleaning on the appropriate forms or in the vehicle or machinery logbook.
- Present the vehicle or machinery to an inspector if required.
- Dispose of any plant material according to the relevant guidelines.

Remember that no clean-down guidelines can detail all the parts to check. This is because there are:

- numerous different models and new models
- different attachments (e.g. different types of blades on dozers)
- different modifications, either in the factory or by previous owners

- varying conditions of the machinery (e.g. rusted parts allowing entry of contaminants into sections that are usually sealed).

Examine the item you are cleaning very carefully for any areas that could be contaminated, even if these areas are not listed in the guidelines, and clean them thoroughly.

3.3 Basic cleaning for all vehicle types[1]

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

The basic cleaning requirements for all vehicles are given in Table 2. It is best to start cleaning at the top of the vehicle and work down to the ground. Carry out the basic cleaning in conjunction with the specific requirements for the type of vehicle, ensuring that you remove all soil and plant material.

Table 2. Basic cleaning requirements for vehicles

Area	Actions
Air tanks	Clean these as for fuel tanks.
Air vents	Unscrew the air vents and blow them with compressed air. If filters are fitted, remove and clean them.
Battery	Remove the battery and clean underneath it.
Battery box	Clean the battery box.
Bodywork	Check all damaged bodywork. Remove any floor or body strips or moldings that form lips where soil or plant material may become trapped, particularly on vehicle floor compartments.
Bumper and brush guard	Clean all hollow sections and attachment points.
Canopy	Remove the canopy and brush it, then clean it with compressed air or high-pressure water.
Canopy bows	Disassemble the canopy bows, then wipe or scrub them with brushes and water. Pay particular attention to locking catches, joints and hollow cross members.
Chassis	Clean the chassis with high-pressure water using equipment with a flexible nozzle. Pay particular attention to small apertures, which may act as reservoirs for soil and plant material.
Dashboard	Use compressed air and dry paintbrushes to clean the dashboard.
Dual wheels	Take extra care cleaning vehicles fitted with dual bogie wheels. If contamination is detected, an inspector may ask for the outer wheel to be removed, cleaned and re-inspected.
Fender wells	Clean the access areas for tail-light wiring and other fender apertures that may collect soil and plant material.
Floor drain plugs	Remove all floor drain plugs to facilitate cleaning. Clean all drain plugs and apertures, paying particular attention to threaded areas.
Floor mats	Remove all floor mats or carpets and clean them.
Fuel tanks	If fuel tanks are strapped to the vehicle, clean them to remove contamination between the tank and the vehicle.

[1] Adapted from *Australian Defence Force military equipment & personnel: guidelines for offshore inspection*—see More Information, page 30.

Area	Actions
Insulation tape	Check all taped areas for contamination and replace the tape with new where necessary.
Interior	Remove all contamination with vacuum or compressed air equipment.
Internal panels, access panels	Where possible, remove all internal panels to allow cleaning of inner compartments.
Lights and reflectors	Remove all damaged lights (internal and external) and any lights where seals have not maintained their integrity, so that you can clean the light fittings.
Metal racks	Clean all box and tubular steel racks (which have openings) with high-pressure water.
Mirrors	Clean all mirror holders.
Radiator (all types)	Clean the radiator with compressed air and follow this with a low-pressure high-volume water wash. You may need to use brushes or to pick seed material from between the veins on the radiator.
Ropes, straps and Velcro	Check and clean all ropes and straps and items containing Velcro. Extend ropes and straps to their full length when cleaning and check all attachment points, fixtures and tension devices
Rubber seals	windscreens, doors, tailgates and other areas and clean or replace them as necessary.
Seatbelts	Clean and check all seatbelts, especially the catches where the seatbelts fasten. You may need to remove any sheaths or covers to adequately clean seatbelts.
Seat cushions	Clean the cushion covers.
Storage and tool compartments	Empty and clean all storage and tool compartments.
Support and cross members	Check and clean the transmission support members and other cross members.
Tools and equipment	Remove all items for cleaning. This may include jacks, wheel braces etc. Wipe tools clean
Toolboxes	Empty and clean all toolboxes. If they are bolted to the floor tray, unfasten and remove them to check there is no debris trapped between the floor and the toolboxes.
Tyres	Clean the tyres, paying particular attention to the tread and any cuts or gashes.
Winch cable drum	Unwind the winch cable and clean the drum, cable and any attachments of any soil and plant material that is embedded in the components or grease.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

3.4 Suggested equipment

- A mobile water tanker or spray unit (ideally) or water pumped from a dam or cattle trough or tank.
- A high-pressure water cleaner or pump.
- A garden hose (for small clean-downs).
- An air compressor (for removing dry material, e.g. from radiators and grain headers).
- Brooms, brushes and a dustpan (for cleaning cabins).
- A vacuum cleaner.

4 Specific cleaning checklists[2]

4.1 Cars, trucks and four-wheel drives

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Interior

- Check and clean the foot wells.
- Check the carpets and mats.
- Check and clean the seatbelts.

Boot

- Check and clean the carpet (checking for deposits of hay, weed seeds, burrs and/or soil).
- Check and clean the spare tyre area.
- Check and clean other recesses in the boot or rear of the vehicle.

Engine bay

- Check and clean the radiator.
- Check and clean the grill.
- Check and clean the top of the transmission gearbox.
- Check and clean the recess under the windscreen wipers.
- Check and clean the air filters.

Underside

- Check and clean the wheel arches, wheel trims, flares, step treads and bumpers.
- Check and clean the mudflaps.
- Check and clean the tyre rims (particularly the near side).
- Check and clean the axles and differentials.
- Check and clean the spare tyres on four-wheel drives and station wagons. These are often suspended underneath.

Note: These are high-risk areas, as contaminants collect inside the horizontally positioned rim.

Other areas

- Check and clean all toolboxes, ladders and storage compartments.
- Check and clean the back or tray of trucks and four-wheel drives.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

[2] Adapted from the Australian Department of Agriculture's machinery cleaning guides and checklists—see More information, page 30

4.2 Compactors[3]

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Cabin

- Remove any rubber floor mats and clean the floor surface.
- Remove and clean all door rubbers and internal door paneling.
- Clean all windowsills.
- Remove and clean under the seat, including the rubber seat shroud.
- Remove any non-affixed floor panels and clean underneath them.
- Remove the rubber pedal covers and clean them.
- Remove the cabin wall lining and clean behind it.
- Clean all air-conditioning vents, including the air-conditioning filter. You may have to remove paneling to do this.
- Remove the joystick control housing and clean inside it.
- Check the cabin roof, both inside and out.
- Remove any false floor under the cabin for cleaning.
- Clean the ladder to the cabin (which may have a hollow frame) and clean under each footstep.
- Remove all light covers and check the cavities behind them.
- If the cabin housing can be flushed via drainage holes, do so.

Engine bay

- Check all surfaces of the engine block, including between tappet covers.
- Remove and clean the air-filter pre-cleaner.
- Remove and clean the air-filter with compressed air.
- Clean inside the fan belt flywheels (harmonic balancer).
- Remove and clean any belly plates.
- Remove all non-affixed engine covers to allow access and clean all surfaces.
- Check the engine covers for any hollow support frameworks and flush these to ensure that they are clean.
- Remove all engine cover rubbers and clean them.
- Flush the hollow chassis rails either side of engine via drainage holes on the underside of the rails. You may need to remove the belly plate bolts to do this.
- Check the battery boxes either side of engine. Loosen the batteries and clean under them.
- Flush the radiator and oil cooler from both sides to ensure that the fin and core are clean.
- Loosen the radiator shroud to let loose debris fall through.
- Check either side of the radiator for vertical hollow support structures and flush them.
- Check inside all wiring harnesses.
- Check under all hydraulic looming.
- Remove zip-ties and electrical tape that hold hydraulic hoses together—this will facilitate cleaning.

[3] Adapted from the Australian Department of Agriculture's cleaning guide and checklist for compactors—see More information, page 30.

- Check all surfaces of the fuel cell (which generally sits below the radiator and the engine).

Wheel drums, boots and rims

- Check inside each cleat/boot on each wheel drum—generally these are only spot-welded or are hollow with access points.
- You may need to remove plates inside the wheel rims to access the brake drums. If so, remove them and clean them thoroughly.

Tyres

- Check each tyre for cracks or splits that can harbour seeds, soil or any other risk material.

Front end and bucket/blade

- Remove the front housing cover plate to allow better access to the hydraulics.
- Remove the cutting teeth from the bucket.
- Remove all non-affixed wear plates from the bucket.
- Check the front and back of the bucket for any cracks, splits or evidence of repair. If any are detected, the inside will need to be verified clean.
- Check any light mounts on the front wheel arches—these are generally hollow and require cleaning.
- Bucket push arms are generally sealed units, and check for hollow areas and drainage points.

Other areas

- Check all wheel arches for hollow support frameworks. You may have to loosen these from the chassis to clean where they join the arches.
- Clean all surfaces of the oil tank (which is generally near the ladder to the cabin).
- Clean and flush under all non-slip checker-plate surfaces.
- If the rear drawbar is hollow, remove the towing pin and flush the drawbar.
- Remove all contaminated grease on the machine, including around pivot points.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.3 Cotton pickers

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also the following checks, cleaning as necessary.

Row units

- Examine the picking heads externally for cotton trash or soil and plant material.
- Open all picking head inspection doors to expose the moisture racks, doffers, spindle bars and rotor assemblies. Manually rotate and check and clean the rotor assemblies.
- Open the rear inspection doors on the air ducts (located at the rear of the picking heads). Raise the picking heads to check and clean their underside.

Note: The picking heads are held up by hydraulics—DO NOT climb underneath them unless the heads are safely secured in the raised position.

Cabin

- Check externally under and around the cabin. Check under the mats in the cabin. Check the air-conditioning system (where fitted), including ducts and filters.

Air ducts

- Remove/open all cover/inspection panels. (These horizontal ducts convey cotton from the front picking section to the basket.)
- Check and clean all air ducts from the top.

Basket

- Check and clean the basket roof.
- Access the internal parts of the basket through the hinged door on the roof. (You will need a ladder to climb into the basket.)
- Tip or elevate the basket (depending on the model) to check and clean the underside, drive shaft assemblies, blower fan and hollow basket support frames (located on the left- hand side of some models).

Note: The meshed surface area of the basket will NOT support a person's weight—walk only on the perforated metal walkways that run from the back to the front of the machine. The basket is lifted by hydraulics—DO NOT climb under the basket unless it is properly and safely secured in its raised position.

Undercarriage/chassis

- Check all undersides of the machine, chassis rails and telescopic rear axle if fitted.

Engine

- Remove the cover panel to expose the top of the radiator. (This can be done when the basket is in the raised position.)
- Remove or open all screens on the engine, radiator and fuel bays.

Tyres

- Check for soil or any other contaminants.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.4 Dump trucks[4]

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Cabin

- Remove any rubber floor mats and clean the floor surface.
- Remove and clean all door rubbers and internal door paneling.
- Clean all windowsills.
- Remove and clean under the seat, including the rubber seat shroud.
- Remove any non-affixed floor panels and clean underneath them.
- Remove and clean the rubber pedal covers.
- Clean inside all air-conditioning vents and ensure there is access for inspection.
- Clean inside all joystick controls and ensure there is access for inspection.
- Check the cabin roof and walls, both inside and out.
- Clean the ladder (which may have a hollow frame) and clean under each footstep.
- Clean inside all light covers and ensure there is access for inspection.
- Check for a false floor under the cabin and if it is present, remove it for cleaning.
- If the vertical cabin housing can be flushed via drainage holes, do this.

Front end and radiator

- Remove the radiator grill (both outside and inside). Access will be required for inspection.
- Loosen the radiator shroud to let loose debris fall through.
- Check either side of radiator for vertical hollow support structures. If they are present, flush them.
- Clean inside all light covers. Access will be required for inspection.
- If the front drawbar has drainage holes, flush them.
- If the vertical channels either side of the radiator have drainage holes, flush them.
- Check the air filter (using compressed air if necessary).
- Remove any non-affixed panels from the front of the cabin to access the air-conditioner.

Engine bay

- Remove the air-filter pre-cleaner cover and clean it.
- Remove the air-filter and clean it with air.
- Clean inside the fan belt flywheels (harmonic balancer).
- Check all surfaces of the engine block, including between tappet covers.
- Remove any belly plates and clean them.
- Remove all non-affixed engine covers for cleaning and inspection.
- Remove all engine cover rubbers for cleaning and inspection.
- Check the engine housing for any open-ended or spot-welded hollow support framework and flush it clean.
- Flush the radiator and oil cooler from both sides to ensure that the fin/core is clean.
- Check the battery boxes. Loosen the batteries and clean under them.
- Check all wiring harnesses.

[4] Adapted from the Australian Department of Agriculture's cleaning guide and checklist for dump trucks—see More information, page 30.

- Check under all hydraulic looming.
- Ensure that all engine mounts are clean.
- Ensure that all surfaces of the sump and the engine block are clean.
- Remove all contaminated grease from the universal joints.
- Clean inside all light covers. They will need to be accessed for inspection.
- Remove zip-ties and electrical tape that hold electric and hydraulic hoses together—this will facilitate cleaning and inspection.
- Flush under all non-slip checker-plate footings.
- If the wishbone between the front wheels is hollow, flush it via the openings inside the struts.

Rear chassis

- Clean all surfaces of the oil and fuel tanks.
- Check all wiring harnesses.
- Check under all hydraulic looming.
- Clean all universal joints to ensure they are free of contaminated grease.
- Clean all surfaces of the chassis rails.
- Clean all internal ledges and hollow cavities inside the track frames.
- If the carrier rollers above the tracks have a hollow vertical support structure, clean it.

Tyres and rims

- Ensure that all cracks and splits in tyres are free of contamination.
- When checking inside wheel rims, you may need to remove non-affixed plates to access the brake drums and inner rim.
- Remove dual tyres for checking.

Dump tray

- Check all surfaces of the tray for cracks, splits or evidence of repair. If any are detected, they will need to be investigated for internal contamination (if double skinned).
- Check all rubber mounts on the underside of the tray.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.5 Excavators

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Cabin

- Remove any rubber floor mats and clean the floor surface.
- Remove and clean all door rubbers and internal door paneling. Clean all windowsills.
- Remove the cabin wall lining and clean behind it.
- Remove and clean under the seat, including the rubber seat shroud.
- Remove any non-affixed floor panels and clean underneath them.
- Remove and clean the rubber pedal covers.
- Remove and clean inside the joystick control housing.
- Check all air-conditioning vents, including the air-conditioning filter. You may have to remove some paneling for cleaning.
- Check the cleanliness of the cabin roof, both inside and out.
- Clean the ladder to the cabin (if applicable). It may have a hollow frame, so check for possible entry points. Clean under each footstep.
- Remove all light covers and check the cavities behind them.
- If the cabin housing can be flushed via drainage holes, flush it with water.

Body and engine bay

- Remove and clean the air-filter pre-cleaner.
- Remove the air-filter and clean it with compressed air.
- Check all surfaces of the engine block, including between tappet covers.
- Clean inside the fan belt flywheels (harmonic balancer).
- Remove all non-affixed engine covers and clean all surfaces.
- Check the engine covers for hollow support frameworks and flush them to ensure that they are clean.
- Remove and clean the engine cover rubbers.
- Check either side of the radiator for vertical hollow support structures and, if they are present, flush them to ensure that they are clean.
- Loosen the radiator shroud to let loose debris fall through.
- Check inside all wiring harnesses.
- If necessary, remove the counterweights to allow cleaning and inspection.
- Remove and check the engine cover rubbers.
- Remove zip-ties and electrical tape that hold hydraulic hoses together—this will facilitate cleaning.
- Loosen the batteries and clean under them.
- Flush the radiator and oil cooler from both sides to ensure that the fin/core is clean.
- If the bottom rails along the sides are open ended, flush them with water.
- Check the sump and engine block.
- Remove all contaminated grease from the hydraulic rams.
- Check all lights and cavities behind them.
- Check all rubber engine mounts.
- Flush under all non-slip checker-plate footings to ensure they are clean.

Tracks, rollers and frame

- Remove the track rock guards to allow access to inside the track frames.
- Once the rock guards have been removed, check where the bolts attach to the frame. If this is hollow, flush it.
- Remove any individual rubber track pads (usually on small excavators).
- Remove the motor cover plates and clean inside the drive motor.
- Individually clean each countersunk bolt hole on the rollers.
- Flush the hollow track frame ends to remove all contamination.
- Remove all non-affixed covers and plates.
- Turn the roll tracks one revolution to check each track pad and the countersunk bolts on the rollers and idler wheels.
- Clean behind the sprockets.
- Thoroughly clean the spring adjuster inside the track frame.
- If the carrier roller above the tracks has a hollow support structure, check it.
- If the excavator has telescopic tracks (generally only small excavators), extend them and clean inside them.
- Clean all internal ledges and hollow sections inside the track frames, as these can harbour contamination.

Boom stick and bucket

- Check the front and back of the bucket for any cracks, splits or evidence of repair. If any are detected, the inside will need to be verified as clean.
- Remove all non-affixed wear plates.
- Flush spot-welded wear plates on the back of the bucket.
- Remove all cutting teeth (boots) from the bucket.
- If the boom arm is hollow, remove all external non-affixed plates.
- Clean all knuckles, removing all contaminated grease.
- Remove the cutting teeth from the blade.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.6 Headers and harvesters

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also do the following checks, cleaning as necessary.

All harvesters

Check and clean:

- the area under the skid plate.
- each header knife and finger.
- the auger located horizontally across the header.
- the area behind any cover on the header.
- the area within any belts on any draper front (if fitted).
- the feeder house.
- the cabin floor area.
- the cleaning fan and the area between the bottom of the fan housing and any shield under the fan housing.
- the chassis, including inside any rail ledges, the back axle-beam and the undercarriage.
- any tailing auger.
- any sieve area, including the full length and width of the grain pan.
- any grain bin area, including any auger.
- the engine compartment, including the radiator core.
- any grain or repeat elevator, including any cups and rubber flights.
- any straw spreader or chopper.
- the tyres and rims.

Conventional harvesters

Check and clean:

- the threshing or separating area, including the drum and concaves behind the rasp bars and lead-in plates and around the concave wires.
- the beater drum, including the area between the drum and walkers.
- the straw walkers, including the beater and the chaff pan, underneath the straw walker and any concealed areas under rubber air flaps.

Rotary harvesters

Check and clean:

- the external top and sides of the conical section of the rotor cage.
- the areas inside the top of the conical section.
- the threshing or separating area, including along the rotor cage.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.7 Mini tractors

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Tyres and rims

- Check all parts of the tyres and rims, including the inner sides of the rims.
- Check for gaps in split-type rims.
- Check for any cuts and gashes in the tyres.
- Check any wheel-mounted counterweights.

Chassis

- Check the inside of the chassis rail ledges.
- Carefully check for hollow areas and cover plates that may conceal voids.
- Check voids in the area between the gearbox and the engine. (Several models have a large void that is accessible from underneath)
- Check voids in the counterweights. You may need to remove multiple counterweights for cleaning.
- Check any hollow sections in the sub-frame under the motor that links the chassis rails.

Engine

- Remove the grill (usually by unscrewing two wing nuts) and clean it.
- Remove the wire mesh screen from the front of the radiator and clean it.
- Check and clean the fan shroud at the rear of the radiator.
- Remove and clean the air filter cover, remove the dust dish from the air filter cover, and remove and check the air filter/cleaner. (If you cannot clean these satisfactorily, you may need to destroy them and install new ones.)
- Check around the fuel tank and brackets for build-up of soil and plant material.
- Check all areas in the bonnet and in the engine bay for hollows and clean them.

Other

- Check the external rear brake assemblies and the common shaft for the brake and clutch pedals.
- Check the foot plates and mounting brackets.
- Check the hollow sections in the mudguards, the joints between the mudflaps and the mudguards and the wiring looms under the mudguards.
- Check and clean the toolbox under the seat or the fuel tank. Empty it before cleaning.
- Check and clean any torn seats and exposed foam at the rear of the seat. (Soil and plant material can become lodged in the cushioning.)
- Check and clean the rear axles, in particular the track-width adjustment pinholes.
- Check and clean the drawbar and mounting.
- Check and clean the three-point linkages and operating levers.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.8 Power Take Off (PTO) rotary hoes

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also do the following checks, cleaning as necessary.

- Check and clean the tyres and mounting bolts for soil. You may need to remove the tyres or loosen them from their adaptors on the horizontal shaft so that you can remove soil from the void.
- Remove or loosen the skid/wear plate from the vertical gear casing. (This casing is filled with oil, so make sure you remove or loosen only those bolts securing the plate.)
- Check the body of the hoe for double skins or voids that could contain soil due to inadequate or incomplete weld joints.
- Check and clean all areas where mudflaps are attached or plates overlap.
- Check for hollow sections in reinforcing ribs.
- Check and clean the three-point linkage attachment points, the PTO knuckles and tube, the universal joints and the shafts.
- Check and clean all ground-engaging areas for signs of wear that could allow the ingress of soil or plant material.
- Rotate the rotary shaft and probe for plant material that may be caught in the bearing housing at the ends (or middle if twin shafted).
- Check and clean the frame, supports and mounts for the trailing wheels. These are often hollow sections.
- Check and clean the trailing wheels. These are usually hollow and are made from two pieces of metal welded together. With wear, the metal and welds crack and the wheels fill with soil.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.9 Track-type dozers

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Cabin
- Check externally under and around the cabin.
- Check under the mats in the cabin.
- Remove or lift the seat, then remove or lift any floor panels and check the top of the transmission.
- Check that the air-conditioner filter (if fitted) is clean by shaking or tapping it.

Tracks and track frame
- Examine the tracks carefully.
- Remove the inspection/cover plates and check inside the track area.
- Check the idler wheels. (These support the tracks.)

Belly plates
- Remove and check behind these plates.

Rear plates
- Remove and check behind these plates.

Hydraulic cover plates
- Remove and check behind these plates.

Engine
- Check the radiator core and engine area.
- Remove and check the air filter/cleaner. Replace it if it is clogged with contaminants.
- Check carefully the void between the oil and radiator cores.

Battery box
- Lift or remove the battery and check under it for contamination. (The battery box may be at the side or at the rear or under the seat.)

Fuel cells
- Remove these and check for any soil and plant material packed between the tank and the frame.

Blades
- Ensure that the edges of the blades (top/bottom) are not split, as this allows soil to pack very tightly in the hollows.
- Check the truncation arms.
- Check carefully the pivot points and adaptors at the rear of the front blade—these allow the blade to change height and angle. Sometimes soil will be compacted and difficult to dislodge.
- Check all hollow sections.

Ripper support frame

- Check carefully to see if any contaminants have entered this hollow section. You may need to remove the tines.

Tines

- Check these carefully. You may be able to remove contamination by water blasting, however you may need to remove the tines for cleaning in some cases.

Ripper points

- A pin holds the ripper points in place. Check for any soil and plant material compacted under the ripper points.

All areas

- Check for any hollow sections or channels and determine whether there is a possible entry point for contamination. Check whether the plates are covering compartments or spaces that may have collected soil or plant material.

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You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.10 Wheeled loaders[5]

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Cabin

- Remove any rubber floor mats and clean the floor surface.
- Remove and clean all door rubbers and internal door paneling. Clean all windowsills.
- Remove and clean under the seat, including the rubber seat shroud.
- Remove any non-affixed floor panels and clean underneath them.
- Remove and clean the rubber pedal covers.
- Remove the wall lining and clean behind it.
- Clean all air-conditioning vents, including the air-conditioning filter. You may have to remove paneling to do this.
- Remove the joystick control housing and clean inside it.
- Check the cabin roof, both inside and out.
- If there is a false floor under the cabin, remove it for cleaning.
- Clean the ladder to the cabin (which may have hollow frame) and clean under each footstep.
- Remove all light covers and check the cavities behind them.
- If the cabin housing can be flushed via drainage holes, do this.

Engine bay

- Check all surfaces of the engine block, including between tappet covers.
- Remove the air-filter pre-cleaner and clean it.
- Remove the air-filter and clean it with compressed air.
- Clean inside the fan belt flywheels (harmonic balancer).
- Remove any belly plates and clean them.
- Remove all non-affixed engine covers to allow access and clean all surfaces.
- Check the engine covers for hollow support framework and flush it to ensure that it is clean.
- Remove all engine cover rubbers and clean them.
- Flush the hollow chassis rails either side of the engine via drainage holes on the underside of the rails. Remove the belly plate bolts for access if necessary.
- Check the battery boxes on either side of the engine. Loosen the batteries and clean under them.
- Flush the radiator and oil cooler from both sides to ensure that the fin/core is clean.
- Loosen the radiator shroud to let loose debris fall through.
- Check either side of the radiator for vertical hollow support structures and flush these to ensure that they are clean.
- Check inside all wiring harnesses.
- Check under all hydraulic looming.
- Remove zip-ties and electrical tape that hold hydraulic hoses together—this will facilitate cleaning.
- Check all surfaces of the fuel cell (which generally sits below the radiator and engine).
- Check the support arm behind the differential, as this can be hollow and harbour contamination.

[5] Adapted from the Australian Department of Agriculture's cleaning guide and checklist for wheel loaders—see More information, page 27

- Check all rubber engine mounts.
- Clean all surfaces of the axles and differential.
- Check the sump and engine block.
- Check all lights and the cavities behind them.
- Remove all contaminated grease from universal joints.

Front end and bucket

- Remove the front housing cover plate to allow better access to hydraulics.
- Remove all cutting teeth (boots) from the bucket.
- Remove all non-affixed wear plates from the bucket.
- Check the front and back of the bucket for any cracks, splits or evidence of repair. If any are detected, the inside will need to be verified clean.
- Check any light mounts on the front wheel arches, as these areas are generally hollow and require cleaning.
- Remove all contaminated grease from all pivot points.
- Bucket push arms are generally sealed units, however check for hollow areas and drainage points.
- Flush spot-welded wear plates on the back of the bucket.

Tyres and rims

- Check each tyre for cracks or splits that contain seeds, soil or any other risk material.
- You may need to remove the plates on the inside wheel rims to access the brake drums, then remove these and clean them thoroughly.

Other areas

- Check all wheel arches for hollow support frameworks. You may also have to loosen these from the chassis to clean where the arches join the frame.
- Clean all surfaces of the oil tank (which is generally near the ladder to the cabin).
- Clean under all non-slip checker-plate surfaces.
- If the rear drawbar is hollow, remove the towing pin and flush the drawbar.
- Remove all contaminated grease, including around pivot points.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

4.11 Wheeled tractors

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also do the following checks, cleaning as necessary.

Tyres and rims

- Check and clean all parts of the tyres and rims, including the inner sides of the rims.
- Check between dual wheels (if fitted).
- Check any wheel-mounted counterweights.
- Check for any gashes or cuts in the tyres.

Engine

- Check the radiator core and grill for residues.
- Check the void between the oil cooler and radiator. (The oil cooler may be hinged or on a slide.)
- Remove and check all air filters/cleaners, pre-cleaners and cyclone-style dust separators. If you cannot clean them satisfactorily, you may need to destroy them and install new ones.
- Check and clean sound-deadening foams and heat shields. (Foams can become impregnated with dust.)

Cabin

- Check externally under and around the cabin.
- Check under the mats in the cabin and in any void or on any skirt under suspended seats.
- Check air-conditioner filters (if fitted). Most large tractors will have a false cabin roof housing the air-conditioning unit, so remove or open the false roof for access.
- Check the integrity of rubber door and window seals. If they are torn, soil and plant material will be sucked into them and trapped.
- Check the void behind consoles and the dashboard.

Chassis and vehicle body

- Check the inside of the chassis rail ledges and the back axle-beam and the undercarriage of this area.
- Check any hollow sections in the front axle tubes.
- Check and clean all toolboxes and battery boxes. These are often under the cabin steps or in the engine bay.
- Check any voids in the rear brake assemblies.
- Check any hollow sections in the drawbars and in the retractable/extendable three-point linkages.
- Check and clean single counterweights. You may need to remove multiple counterweights to clean the voids.
- Check and clean mudguards and wheel flares, and look for hollows and crevices.
- Check and clean roll cages and roll bars. Look for holes and gaps where these are attached to the vehicle.
- For four-wheel drives, check the torque tube (front drive shaft guard) for holes or poor attachment.
- Check and clean the power take-off (PTO) area, PTO shaft, universal joints and shaft covers/PTO tubes.

- Check and clean the wiring looms in split protective conduit.

Note: Some agricultural tractors will have a rear carryall mounted on the three-point linkages or a forward-mounted forklift or bucket/scoop attachment—check these carefully.

Buckets, blades and scoops

- Check and clean all areas of the blade. Look for holes or double skins.
- Remove, check and clean the cutting teeth, adaptors and wear plates on the blades.
- Check and clean the hydraulic arms and supports. Look for hollows that may contain soil and plant material.

All areas

- Check for any hollow sections or channels and determine if there is a possible entry point for contamination. Check whether any plates are covering a compartment or space that may have collected soil and plant material.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent**.**
CHECK, CLEAN, RECHECK

5 More Information

5.1 Invasive plants

To see a current list of Queensland's invasive plants, visit daf.qld.gov.au.

5.2 AgGuide—Machinery hygiene

A hard-copy handbook that includes information about machinery inspection and cleaning to prevent the spread of invasive plants, pests and diseases and is available from the New South Wales Department of Primary Industries Tocal College. Visit www.dpi.nsw.gov.au for details.
https://www.tocal.nsw.edu.au/publications/list/farm-management/agguide-machinery-hygiene

5.3 Australian Defence Force military equipment guidelines for offshore inspection

These guidelines are used by Australian Defence Forces. They are available at

5.4 DAWR machinery cleaning guides and checklists

These guides and checklists have been developed to help importers and offshore cleaners meet Australia's import permit conditions (free of biosecurity risk material) as found in BICON, the Biosecurity Import Conditions system.
These conditions are more onerous than those required by Queensland legislation. The department has provided a generic checklist as well as cleaning guides and checklists for:

- articulated dump trucks
- caterpillar dozers
- compactors
- dump trucks
- excavators
- forklifts
- Hitachi DX40 dozers
- Komatsu dozer
- M motor grader
- medium-sized dozers
- mini excavators
- mini tractors
- motor graders
- scrapers
- skid steer loaders
- wheel loaders.

The guides and checklists illustrate and describe the many areas in machinery that commonly harbour risk (soil and plant) material. Visit http://www.agriculture.gov.au for more information.

http://www.agriculture.gov.au/import/goods/vehicles-machinery/regulations/guides-checklists (accessed 1/03/2019)

5.5 **USA** Armed Forces Pest Management Board Technical Guide No.31

This technical guide (published in 2017) provides information on cleaning techniques and inspection procedures currently used by the United States Department of Defense for washing and reviewing equipment, supplies and vehicles. Visit www.dodinvasives.org for more information.https://www.acq.osd.mil/eie/afpmb/docs/techguides/tg31.pdf (accessed 1/03/2019)

5.6 Tasmanian wash-down guidelines for weed and disease control

These guidelines establish the standard for washing down machinery, vehicles and other equipment to minimise the risk of spreading weed seeds, some insects and plant pathogens in Tasmania. Visit www.dpiw.tas.gov.au to view the guidelines. https://dpipwe.tas.gov.au/Documents/Washdown-Guidelines-Edition-1.pdf (accessed 1/03/2019).

Appendix 2 Introduced flora species identified on project site

Species	Common name	WoNS*	*Biosecurity Act 2014* status
Agave americana	agave		
Alternanthera pungens	khaki weed		
Amaranthus retroflexus	redroot amaranth		
Anredera cordifolia	Madeira vine	Yes	Restricted invasive species
Antigonon leptopus	Mexican creeper		
Araujia sericifera	white moth vine		
Argemone ochroleuca	Mexican poppy		
Asclepias curassavica	red-head cottonbush		
Axonopus compressus	carpet grass		
Baccharis halimifolia	groundsel		Restricted invasive species
Bidens bipinnata	bipinnate beggar's ticks		
Bidens pilosa	cobbler's peg		
Bougainvillea glabra	Bougainvillea		
Bromus catharticus	prairie grass		
Calyptocarpus vialis	creeping Cinderella weed		
Carduus pycnocephalus	slender thistle		
Carduus thoermeri	nodding thistle		
Carthamus lanatus	saffron thistle		
Catharanthus roseus	pink periwinkle		
Cenchrus ciliaris	buffel grass		
Chamaecrista rotundifolia var. rotundifolia	wynn cassia		
Chenopodium album	fat hen		
Chloris gayana	Callide Rhodes grass		
Cirsium vulgare	spear thistle		
Coreopsis lanceolata	coreopsis		
Corymbia torelliana	cadaghi		

Species	Common name	WoNS*	*Biosecurity Act 2014* status
Crassocephalum crepidioides	thickhead		
Cyclospermum leptophyllum	slender celery		
Cynodon dactylon	green couch		
Cynodon nlemfuensis	African Bermuda-grass		
Cyperus eragrostis	drain flatsedge		
Dactyloctenium aegyptium	Egyptian crowfoot grass		
Datura stramonium	thorn apple		
Dolichandra unguis-cati	cat's claw creeper	Yes	Restricted invasive species
Eragrostis curvula	African lovegrass		
Erigeron bonariensis	flaxleaf fleabane		
Erigeron pusillus	Canadian fleabane		
Euphorbia heterophylla	milkweed		
Galinsoga parviflora	yellow weed		
Gamochaeta pensylvanica	cudweed		
Glandularia aristigera	Mayne's pest		
Gomphocarpus physocarpus	balloon cottonbush		
Gomphrena celosioides	gomphrena weed		
Heliotropium amplexicaule	blue heliotrope		
Hypochaeris albiflora	white flatweed		
Hypochaeris radicata	catsear		
Lactuca saligna	wild lettuce		
Lactuca serriola forma serriola	prickly lettuce		
Lantana camara	lantana	Yes	Restricted invasive species
Lantana montevidensis	creeping lantana		Restricted invasive species
Lepidium africanum	common peppercress		
Lepidium bonariense	Argentine peppercress		
Leucaena leucocephala	leucaena		
Ligustrum lucidum	broad-leaf privet		Restricted invasive species
Lysimachia arvensis	scarlet pimpernel		

Species	Common name	WoNS*	*Biosecurity Act 2014* status
Macroptilium atropurpureum	siratro		
Macroptilium lathyroides	phasey bean		
Malva parviflora	small-flowered mallow		
Marrubium vulgare	white horehound		
Medicago polymorpha	burr medic		
Megathyrsus maximus	Guinea grass		
Melinis repens	red natal grass		
Modiola caroliniana	red-flowered mallow		
Nerium oleander	oleander		
Oenothera affinis	long-flowered evening primrose		
Oenothera curtiflora	red-flowered primrose		
Opuntia stricta	prickly pear	Yes	Restricted invasive species
Opuntia tomentosa	velvety tree pear	Yes	Restricted invasive species
Oxalis corniculata	creeping woodsorrel		
Pavonia hastata	pink pavonia		
Phyla nodiflora	lippia		
Portulaca oleracea	pigweed		
Portulaca pilosa	hairy pigweed		
Prunus persica	wild peach		
Raphanus raphanistrum	wild radish		
Rapistrum rugosum	turnip weed		
Richardia brasiliensis	white eye		
Ruellia simplex	Mexican petunia		
Rumex crispus	curled dock		
Schinus molle	narrow leaf pepper tree		
Sida cordifolia	flannelweed		
Sida rhombifolia	comon sida		
Sisymbrium irio	London rocket		
Solanum nigrum	black nightshade		

Species	Common name	WoNS*	*Biosecurity Act 2014* status
Solanum seaforthianum	Brazilian nightshade		
Sonchus oleraceus	common sowthistle		
Sporobolus africanus	Parramatta grass		
Sporobolus fertilis	giant Parramatta grass		Restricted invasive species
Stylosanthes hamata	verano		
Stylosanthes viscosa	sticky sylo		
Tagetes minuta	stinking roger		
Tamarix aphylla	athel pine	Yes	Restricted invasive species
Tecomaria capensis subsp. capensis	Cape honeysuckle		
Tipuana tipu	tipuana		
Urochloa mosambicensis	sabi grass		
Urochloa panicoides	urochloa grass		
Vachellia farnesiana	mimosa		
Verbascum virgatum	twiggy mullein		
Verbena bonariensis	purpletop		
Verbena incompta			
Verbena rigida	veined verbena		
Xanthium occidentale	Noogoora burr		
Xanthium spinosum	Bathurst burr		
Zinnia peruviana	wild zinnia		

* WoNS – Weed of National Significance

Distribution List

Copy #	Date	Type	Issued to	Name
1	31/01/2024	Electronic	RES Australia	Toby Coates and Will McGrane

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