Port Kembla Gas Terminal

Flora and Fauna Management Plan Stage 2A Marine Berth Construction and Onshore Receiving Facilities

Australian Industrial Energy

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→ **The Power of Commitment**

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Acronyms

Acronym	Definition
AIE	Australian Industrial Energy
BC Act	*Biodiversity Conservation Act 2016*
Berth 101	MBD Site Compound
Biosecurity Act	*Biosecurity Act 2015*
CSSI	Critical State Significant Infrastructure
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management Strategy
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 197*
EPBC Act	*Environment Protection Biodiversity Conservation Act 1999*
EPL No 21529	Environment Protection Licence
ESCP	Erosion and Soil Control Protocol
FFMP	Flora and Fauna Management Plan
FSRU	Floating Storage and Re-gasification Unit
GHD	GHD Pty Ltd
HSE	Health, Safety and Environment
LNG	liquefied natural gas
KPI	Key Performance Indicators
MBD	Marine Berth Construction and Dredging
MLA	Marine Loading Arms
MNES	Matters of National Environmental Significance
ORF	Onshore Receiving Facilities
PIRMP	Pollution Incident Response Management Plan
PKCT	Port Kembla Coal Terminal
PKGT	Port Kembla Gas Terminal
PKGT EIS	Port Kembla Gas Terminal Environmental Impact Statement
POEO Act	*Protection of the Environment Operations Act 1997*
SRD SEPP	State Environmental Planning Policy State and Regional Development
TECs	Threatened Ecological Communities
The Project	Port Kembla Gas Terminal Project

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1. Introduction

1.1 Overview

This Flora and Fauna Management Plan (FFMP) has been developed as a sub-plan to the Port Kembla Gas Terminal Project (the Project) Environmental Management Strategy (EMS). This FFMP has been prepared by GHD Pty Ltd (GHD) on behalf of Australian Industrial Energy (AIE) to apply to construction activities associated with Stage 2A construction of the Project.

This FFMP interfaces with the other associated sub-plans, which together describe the proposed structure for environmental management and monitoring requirements for the Project. This FFMP addresses the requirements of the Port Kembla Gas Terminal Environmental Impact Statement (PKGT EIS) and associated Infrastructure Approval (SSI 9471) and Environmental Protection Licence (EPL) No. 21529.

1.2 Background

AIE is developing the Project which involves the development of a liquefied natural gas (LNG) import terminal at Port Kembla, south of Wollongong, NSW. The Project will be the first of its kind in NSW and will provide a simple and flexible solution to the state's gas supply challenges.

NSW currently imports more than 95 percent of the natural gas it uses from other eastern states. In recent years, gas supplies to the Australian east coast market have tightened, resulting in increased natural gas prices for both industrial and domestic users.

The Project provides an immediate solution to address the predicted shortages and will result in significant economic benefits for both the Illawarra region and NSW. The Project will have a capacity to deliver more than 100 petajoules of natural gas, equivalent to more than 70 percent of NSW gas needs and will provide between 10 to 12 days of natural gas storage in case of interstate supply interruption. LNG will be sourced from worldwide suppliers and transported by LNG carriers to the gas terminal at Port Kembla where it will be re-gasified for input into the NSW gas transmission network.

The Project has been declared Critical State Significant Infrastructure (CSSI) in accordance with Section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW) and Schedule 5 of the State Environmental Planning Policy State and Regional Development (SRD SEPP). The Project received Infrastructure Approval from the Minister for Planning and Public Spaces on 29 April 2019.

The construction of the Project is primarily associated with the establishment of a new berth facility at Port Kembla to enable an LNG carrier to berth alongside the Floating Storage and Re-gasification Unit (FSRU) and new infrastructure to connect the terminal to the existing gas network. Excavation and dredging would be required to establish the new berth facility, with spoil deposited in a cell (referred to as the 'Emplacement Cell') in the Outer Harbour.

The development has progressed to Stage 2A works located at Berth 101 (referred to as 'the site' or 'MBD Site Compound'). The Stage 2A works include land-based construction works associated with the Marine Berth Construction and Dredging (MBD) and Onshore Receiving Facilities (ORF). The Stage 2A works include:

– Completion of excavation works undertaken during Stage 1 (including transport of spoil materials to Emplacement Cell Construction Site).
– Construction of the quay wall at the MBD Site Compound.
– Construction of ORF at the MBD Site Compound (including construction of Wharf Topside Area, Utility Area, and Common Area).
– Installation and commissioning of power, communications, and potable water line.
– Installation of gas pipeline within the MBD Site Compound as part of ORF.

1.3 Purpose

This FFMP has been prepared in accordance with the PKGT EIS and associated Infrastructure Approval (SSI 9471) and EPL No. 21529. It describes how the management measures and commitments in the PKGT EIS,

Infrastructure Approval (SSI 9471) and EPL No. 21529 relating to flora and fauna are to be implemented by the Principal Contractor during Stage 2A construction of the Project. Specifically, this plan includes requirements to:

– Manage and minimise potential impacts to fauna.
– Reduce the potential risk of the introduction of weeds and pathogens.

AIE and its contractors acknowledge that minimising risks to flora and fauna in the vicinity of the MBD Site Compound is paramount to the successful delivery of the construction phase of the Project. AIE is committed to ensuring this FFMP is reviewed and updated regularly to ensure its objectives are met and that the approval conditions outlined in the Infrastructure Approval (SSI 9471) and EPL No. 21529 are achieved.

This FFMP is applicable to all staff, employees, subcontractors, and any statutory service authorities undertaking the Stage 2A works described in Section 2 of this FFMP. The FFMP implementation and on-going development will be managed by the Project Team (refer to Section 3).

2. Project overview

2.1 Site description

The site of the Project is situated at Port Kembla within the Illawarra region of NSW, about 80 kilometres south of Sydney. Port Kembla is mainly characterised by an existing import and export terminal and multiple other business, cargo, logistics, bulk goods, and heavy industrial facilities in the vicinity.

Port Kembla is situated about two kilometres south of the centre of Wollongong. Other localities surrounding Port Kembla and the Project site include Mangerton, Mount St. Thomas and Figtree to the north-west; Unanderra to the west; Berkeley to the south-west; and Cringila, Lake Heights, Warrawong and the residential region of Port Kembla to the south.

The zoned land use in the region includes special use and industrial use at Port Kembla and a mix of primarily residential and commercial uses at the surrounding localities. Major infrastructure in the region of Port Kembla includes the Princes Highway, which is a major state and regional highway connecting Sydney and Wollongong and regional areas further south. Princes Highway provides access to Port Kembla through turnoffs at Masters Road, Five Islands Road and Northcliffe Drive and is broadly utilised including by heavy vehicles from the port.

The South Coast railway line runs along the periphery of Port Kembla including the stations Port Kembla, Port Kembla North, Cringila and Lysaghts. The rail line services commuters and is also used to transport bulk solid goods like coal, grain, copper and steel from Port Kembla. The environmental features of Port Kembla and the surrounding region are limited given the extensive industrial, commercial and residential development. Waterways in the region include the Gurungaty Waterway, Allans Creek, American Creek and Byarong Creek. Green space includes JJ Kelly Park and Wollongong Golf Club to the north and a larger open area to the south-west.

The Project will be predominantly located within land zoned for dedicated port and industrial uses. Berth and wharf facilities, as well as the FSRU, would be situated at Berth 101 at the Inner Harbour, while the gas pipeline would extend around the periphery of port operations from Berth 101 to a tie-in point at Cringila. The Emplacement Cell will be located in the Outer Harbour. A site overview is provided as Figure 2.1..

Figure 2.1 Site overview

2.2 Project construction scope of works

2.2.1 Overview

The Project construction scope of work has been divided into the three main packages (with associated activities), as outlined in Table 2.1. This FFMP applies only to the works associated with Stage 2A.

Table 2.1 Construction stages/work packages

Stage	Package	Proposed commencement	Activities
1	Early Enabling Works	May 2021	Demolition of Berth 101, removal of structures and land based excavation works, and Cone Penetration Testing (CPT) in the Outer Harbour to inform Emplacement Cell design and relocation of Bunker Oil Pipeline.
2A	Marine Berth Construction – Land Based	January 2022	Completion of excavation works undertaken during Stage 1. Transport of spoil materials for storage at the Emplacement Cell Construction Site.
			Quay wall construction.
		February 2022	Installation of communications conduit, potable water line, and 11kV power cable and Padmount Substation within MBD Site Compound.
		April 2022	Construction of the ORF, which comprises three areas: Wharf Topside Area; Utility Area; and Common Area.
		June 2022	Pipeline construction and associated ancillary infrastructure within MBD Site Compound delivered as part of ORF scope.
2B	Marine Berth Construction and Dredging – Land and Marine Based	March 2022	Continuation of Stage 2A with addition of the following activities:
			Excavation/dredging and construction of the Emplacement Cell in the Outer Harbour.
			Marine based construction activities including installation of navigational aids and revetment shore protection.
3	Pipeline Installation including tie-ins (NGP)	June 2022	Construction of an 18” onshore natural gas pipeline approximately 6.3km in length from the Berth 101 site boundary to Tie-in Facility at Cringila for connection to the Eastern Gas Pipeline. Pipeline construction to occur concurrently with Jemena, subject to separate set of management plans.

The construction of Stage 2A works is located within the former Port Kembla Coal Terminal (PKCT) Bulk Products Berth (Berth 101). As part of the Early Enabling works the removal of existing structures and services and excavation was undertaken to facilitate subsequent development stages of the Project.

The following will be undertaken as part of the Stage 2A land-based works:

– Construction of the quay wall at MBD Site Compound incorporating finalisation of excavation works undertaken during Stage 1 (including transport of spoil materials to Emplacement Cell Construction Site).
– Installation of and commissioning of power, communications, and potable water line.
– Construction of ORF at MBD Site Compound (including construction of Wharf Topside Area, Utility Area, and Common Area).
– Installation of gas pipeline within the MBD Compound site.

An outline of the tasks associated with Stage 2A is provided in Section 2.3 through Section 2.5. The site of the works includes the MBD Site Compound with materials being transported to the Emplacement Cell Construction Site. The location of the Stage 2A works, MBD Site Compound, and the Emplacement Cell Construction Site is shown in Figure 2.2.

Figure 2.2 Stage 2A works and location of MBD Site Compound and Emplacement Cell Construction Site

2.2.2 Traffic

Traffic generated by Stage 2A will be controlled through the gate on Sea Wall Road. Heavy vehicle movements will be generated by the delivery of materials, equipment, and plant to the MBD Site Compound and transport of stockpiled material to the Emplacement Cell Construction Site.

There may be a requirement to transport and tip up to 8000m³ of crushed concrete and up to 2000m³ of crushed heavily bound base course to the Emplacement Cell Construction Site via road to increase the storage footprint area within the East Stockyard and to facilitate for later use during the construction of the Emplacement Cell.

The activities associated with this task will involve loading, road transportation via truck and trailer (approximately 30-tonne capacity), unloading, stockpiling, and management of the stockpiles.

Light vehicle movements will be generated from construction workers accessing the MBD Site Compound. Parking will be provided for up to 76 workers on the MBD Site Compound (refer to Figure 2.3).

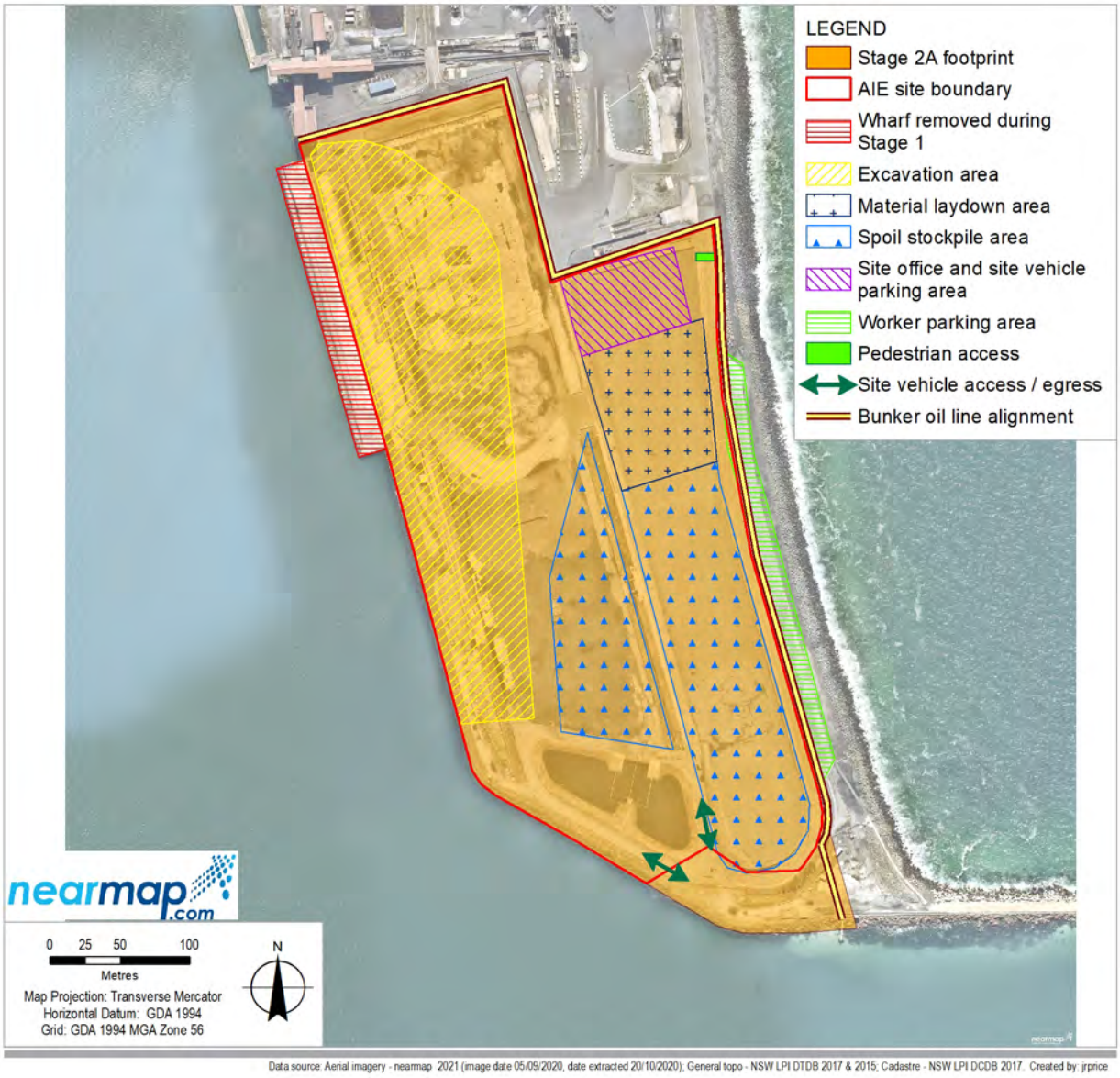


Figure 2.3 Layout of MBD Site Compound

2.2.3 Program

The Stage 2A works are anticipated to commence in January 2022. Stage 2B which includes the continuation of land-based construction and water-based works) are then anticipated to commence in March 2022 (refer to Table 2.1).

2.3 Construction of quay wall (MBD – Land Based)

A number of structures will be constructed within the MBD Site Compound to accommodate the FSRU and LNG carrier for the Project. Excavation and stockpiling activities from the Stage 1 Early Enabling Works will continue on-site during Stage 2A to lay the platform for ongoing construction activities at the MBD Site Compound.

The new structures that will commence construction during Stage 2A are summarised in Table 2.2. The location of the quay wall and layout of the marine berth and wharf facilities is shown in Figure 2.4.

Table 2.2 Marine berth and wharf structures to be constructed during Stage 2A

Component	Works required
Earthworks and stockpiles	– Completion of excavation and backfilling works from Stage 1 Early Enabling Works. – A nominal 15-metre-wide section on the northern end and a circa 60-metre 'wedge' at the south- west corner of the excavation zone was left to facilitate contractor access and will required completion at commencement of Stage 2A. – Excavated materials from the Early Enabling Works have been stockpiled within the Eastern and Western Stockyards of the MBD Site Compound and the Emplacement Cell Construction Site. – The excavated materials stockpiled include: • Approximately 15,000m³ of demolished concrete crushed to nominal 70mm minus. • Approximately 30,000m³ of heavily bound base course crushed to nominal -150mm minus. • Approximately 25,000³ of mixed slag, general fill, and coal nominally < 150mm in size. • Approximately 10,000m³ of predominantly sand with some slag and coal. – The excavated materials will be used/reused for quay wall construction and to backfill the landside area of the quay wall or transported to the Emplacement Cell Construction Site for storage and use in construction of the Emplacement Cell.
Quay wall	– Construction of a new piled quay wall keyed into bedrock complete with sheet pile anchor wall, capping beam and tie rods to the south of the existing coal terminal. – Excavated and processed materials from the Stage 1 Early Enabling Works are stockpiled within the MBD Site Compound and will be used during construction of the quay wall and to backfill on landside area of the wall. – Installation of a marine fender system attached to the capping beam along the quay wall to protect the quay wall from berthing and mooring loads. – Installation of a cathodic protection system to the quay wall and associated elements, including assessment of the potential impacts the FSRU and pipeline cathodic protection will have on quay wall. – Backfilling and compaction on landside area of wall utilising the site stockpiled materials.
Mooring dolphins	– Installation of landside mooring dolphin structures on reinforced concrete platforms supported by steel piles. – Mooring equipment will be installed and comprise the following: • 20 load sensing quick release hooks. • Up to four land-based mooring winches on mooring dolphins may be required. • Up to four swivel fairleads may be required to enable each mooring line to land-based winches to be fed in a horizontal alignment.
Marine Loading Arm foundations	Construction of a new reinforced concrete foundation supported on steel piles, located behind the new quay wall.
Gangway tower foundation	Construction of foundation for Gangway tower
Fire monitor foundation	Fire monitor foundations, subject to risk studies.

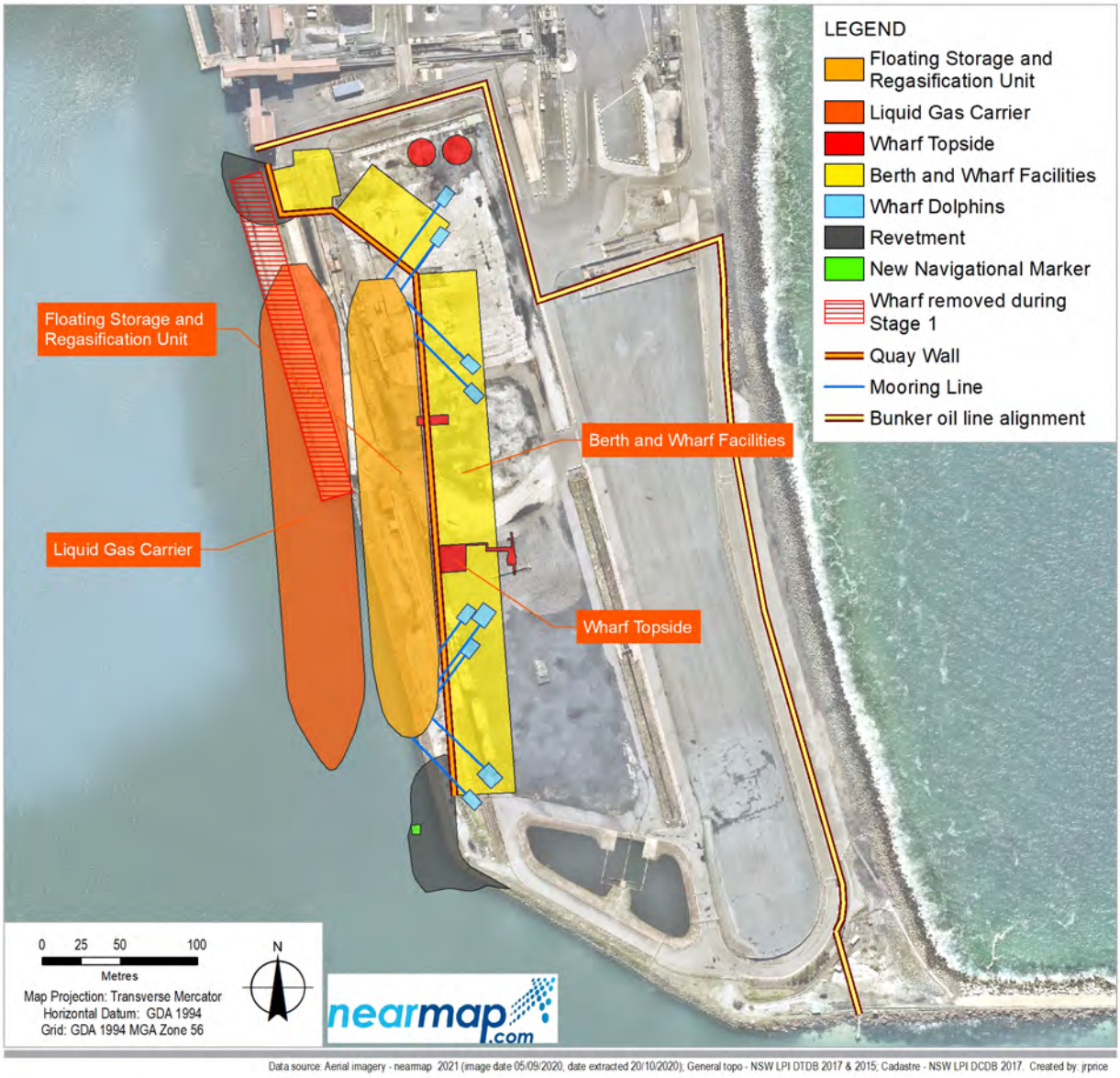


Figure 2.4 Location of quay wall and layout of MBD and ORF

2.4 Power, communications, and water connections

Works required for power, communications, and water connections are summarised in Table 2.3.

Table 2.3 Construction of power connections for Stage 2A

Component	Works required
Power and communications	– Construction and installation of a new 11kV power cable in a buried conduit and Substation. – Energisation of the Padmount Substation and 415kV Temporary Building Supply. – Installation of communication conduit and pits.
Potable water	– Extension of existing potable water line within MBD Site Compound.

2.5 Construction of ORF

The general layout of the ORF areas is shown in Figure 2.3. Works required for the three ORF areas are summarised in Table 2.4.

Table 2.4 Structures to be constructed for ORF during Stage 2A

Component	Works required
Wharf Topside Area	
Marine Loading Arms (MLAs)	Installation of MLAs, including: – Civils and structures. – Associated works such as piping, hydraulics, electrical, instrumentation, and auxiliary systems.
Piping and valving	– All necessary piping and valving. – Odorant injection facilities. – Pig launcher, downstream of the MLAs to tie-in to the Natural Gas Pipeline.
Gangway	– Gangway access tower to provide connection between the wharf and FSRU.
Utility connections	FSRU utilities connections for: – Communications. – Marine Diesel Oil. – Freshwater. – Sewage, bilge, and grey water.
Utility Area	
Site Utilities	Site utilities including: – Potable water and sewerage. – Instrument air and bottled nitrogen. – Diesel storage. – Electrical distribution (including UPS and emergency diesel generators). – Control and instrumentation. – Telecommunications.
Common Areas	
Firefighting systems and equipment	Firefighting equipment including: – Firewater storage. – Pumps. – Firewater monitors.
Security systems and equipment	– CCTV. – Fencing and gates. – Security access and monitoring systems.
Equipment housing	Equipment shelters and buildings to house:

Component	Works required
	– Electrical, control, and operating equipment, critical spares, emergency response and site monitoring facilities. – Buildings will include appropriate building services e.g., HVAC, potable water, amenities, sewerage etc.
Site roadways, lighting and drainage	– Roads and car parking areas. – General lighting, earthing, lightning system. – Drainage system to tie into the existing Port Kembla drainage system.
Gas Pipeline	A section of gas pipeline will be installed within the MBD Compound site as part of the Stage 2A works. Final safety studies will be prepared prior to the construction of the gas pipeline and prior to commencement of operation as per Schedule 3, Condition 21 of Infrastructure Approval (SSI 9471).

3. Roles and responsibilities

The Project Team is responsible for all activities associated with Stage 2A, including the implementation and maintenance of the various mitigation/management measures outlined in this FFMP. Relevant roles and responsibilities of the Project Team are outlined in Table 3.1.

Table 3.1 Roles and responsibilities of Project Team

Project Role	Responsibility
AIE Project Director	– Responsible for the overall funding and direction of civil and environmental works associated with Stage 2A. – Ensuring provision of adequate resources to achieve the environmental objectives for the project including ensuring sufficient resourcing for the Environmental Team, Engineering and Construction Teams.
AIE Construction Manager	– Proactively stewards the effective implementation of Stage 2A in accordance with requirements of the Infrastructure Approval (SSI9471), this FFMP, EMS, and all related Sub-Plans. – Demonstrate proactive support for environmental requirements.
AIE HSE Manager	– Develops and update all Health, Safety and Environmental (HSE) Management Strategies and Sub-Plans. – Ongoing liaison and engagement with government agencies and point of escalation for any environmental incidents. – Identifying environmental issues as they arise and proposing solutions. – Coordinate and facilitate weekly environmental inspections with the key contractors. – Environmental Reporting.
Principal Contractor Project Manager	– On-site Project management and control. – Decision-making authority relating to environmental performance of the construction program. – Authority over Project construction and site activities in accordance with the EMS. – Ensure relevant training is provided to all Project staff prior to commencing individual activities. – Reports to AIE Construction Manager on environmental matters. – Ensures appropriate Contractor resources are allocated to implement the environmental requirements. – Responsible for planning and scheduling of construction, and to ensure operations are conducted in accordance with statutory requirements and the EMS. – Monitors performance against environmental Key Performance Indicators (KPI's). – Ensures that all environmental objectives associated with the Project are achieved. – Day-to-day decision-making authority relating to environmental performance of construction activities and direct site activities and construction. – To provide resources to ensure environmental compliance and continuous improvement. – Ensure all personnel are aware of any changes to EMS, this FFMP and improved procedures. – Ensure this FFMP is implemented for the duration of Stage 2A.
Principal Contractor Construction Foreman	– Implement requirements contained in the EMS and Sub-Plans, work procedures and standard drawings. – Maintaining open and transparent communication with other Project discipline managers and other areas of the Project. – Reporting of hazards and incidents and implementing any rectification measures. – Ensures appropriate contractor resources are allocated. – Orders STOP WORK for any environmental breaches and reports incidents to the Project Manager. – Ensure this FFMP is implemented for the duration of Stage 2A.

Project Role	Responsibility
Project Ecologist	– Undertake pre-clearance surveys prior to removal of detention ponds and construction within movement corridor for Green and Golden Bell Frog. – To be present during removal of detention ponds and during construction within movement corridor of Green and Golden Bell Frog. – Identification and handling of any fauna species encountered during Stage 2A.
Principal Contractor Environmental Representative	– Delivers environmentally focussed toolbox talks and provides applicable site inductions. – Provides environmental advice, assistance, and direction to Project Manager to ensure construction activities are conducted in accordance with regulatory legislation and this EMS. – Participate and cooperate with AIE HSE Manager with regards to undertaking of joint weekly environmental site inspections. – Coordinate / undertake wet-weather inspections as per EPL No. 21529 and report accordingly to the AIE HSE Manager. – Develop strong working relationships with the AIE team and Consultants. – Ensure environmental risks are appropriately identified, communicated, and effectively managed. – Ensure communication of relevant environmental information to Project personnel. – Provide specialist advice and input as required. – Ensure construction manager, superintendents and field supervisors fully understand the environmental constraints and how construction practices must ensure any such constraints are considered and mitigated against during construction. – Orders STOP WORK for any environmental breaches and immediately reports incidents to Principal Contractor Project Manager and AIE HSE Manager.
AIE Environmental Representative	– Develop strong working relationships with the Principal Contractor Team and Consultants. – Ensure environmental risks are appropriately identified, communicated, and effectively managed. – Instruct and advise management team on compliance issues. – Provide specialist advice and input as required. – Co-ordinate internal audits of this FFMP. – Conduct audit review as required. – Reports on the performance of this FFMP and recommends changes or improvements to Project Manager. – Orders STOP WORK for any environmental breaches and immediately reports incidents to the AIE Construction Manager and AIE HSE Manager. – Conducts investigation and response to environmental complaints and inquiries, where required.
Subcontractors and construction personnel	– Undertake an environmental induction prior to accessing to site. – Comply with legislative requirements. – Participate in weekly inspections and audits. – Follow environmental procedures. – Report all environmental incidents and hazards. – Introduce environmental topics to prestart meetings. – Ensure that all relevant permits and clearances are in place prior to commencing work.

4. Legislative requirements

The legislative requirements applicable to Stage 2A are listed in Table 4.1.

Table 4.1 Legislation and relevant policy applicable to this FFMP

Legislation and Regulation	Description	Applicability
Commonwealth		
Environment Protection Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage environmental values considered to be of national environmental significance. The EPBC Act requires approval from the Commonwealth Minister for the Environment for actions that are likely to have a significant impact on listed matters of national environmental significance (MNES). It is the responsibility of the applicant proposing to undertake an action to initially consider whether the proposal is likely to have a significant impact on any MNES. If the applicant considers there is potential for significant impacts upon any matters protected under the EPBC Act, then a referral is required to be submitted to the Minister for the Environment. Developments considered likely to result in significant impacts are defined as "controlled actions" and require assessment and approval.	Consideration of potential impacts upon listed threatened species and communities and any other MNES potentially impacted by the Project has been undertaken as part of the EIS. No impacts have been identified that are considered likely to be significant and consequently a referral to the Commonwealth Minister for the Environment was not undertaken.
NSW		
Biodiversity Conservation Act 2016 (BC Act)	The BC Act aims to conserve biodiversity at the bioregional and state scale and lists a number of threatened species, populations, and ecological communities to be considered when deciding if a project is likely to have a significant impact on threatened biota, or their habitats.	A detailed biodiversity assessment report was prepared as part of the EIS, and the Project would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the BC Act. The MBD Site Compound where Stage 2A construction works will occur has had previous sightings of the Green and Golden Bell Frog, a listed threatened species. Management measures related to Green and Golden Bell Frogs have been included in Section 8.
Biosecurity Act 2015 (Biosecurity Act)	The Biosecurity Act specifies the duties of public and private landholders as to the control of priority weeds and biosecurity matters including terrestrial, aquatic, and marine species. The Biosecurity Act defines prior weeds by local government area and assigns duties for their control. Part 3 of the Biosecurity Act provides that any person who deals with biosecurity matter and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter has a duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated, or minimised.	The detailed biodiversity assessment report prepared as part of the EIS recorded the presence of weed species within the Project area, listed in Section 6.3. The MBD Site Compound where Stage 2A construction works will occur has been extensively cleared of vegetation. Construction vehicles and workers entering the Site could potentially introduce weed and/or pathogen species. Management measures have been developed in accordance with the Biosecurity Act requirements and are outlined in Section 8.4.

5. Planning requirements

5.1 Conditions of approval

The planning requirements and the corresponding flora and fauna management measures applicable to Stage 2A are listed in Table 5.1. Management measures are detailed in Section 8.

The planning requirements include the conditions set out in the Infrastructure Approval (SSI 9471) dated 24 April 2019 and the mitigation/management measures outlined in the PKGT EIS.

Table 5.1 Approval conditions

Requirement	Reference	Responsibility	Evidence	Applicability to this FFMP
Infrastructure Approval Requirements (SSI 9471)				
Aquatic Habitat The Proponent must design and construct the water intake on the FSRU to minimise entrainment of aquatic organisms and plankton.	Schedule 3, Condition 2			Not applicable to Stage 2A
Biodiversity Offsets Prior to the commencement of construction, unless otherwise agreed by the Planning Secretary, the Proponent must retire biodiversity credits of a number and class specified in Table 1 and Table 2 below in consultation with BCD and to the satisfaction of BCT. The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Scheme and can be achieved by: a. acquiring or retiring 'biodiversity credits' within the meaning of the *Biodiversity Conservation Act 2016* b. making payments into an offset fund that has been developed by the NSW Government; or c. funding a biodiversity conservation action that benefits the threatened entity impacted by the development, consistent with the 'Ancillary Rules: Biodiversity conservation actions'.	Schedule 3, Condition 20			Applicable – credits have been retired pre-construction (refer to Appendix A)
PKGT EIS Management Measures				
A site specific emergency spill plan will be developed, and will include spill management measures in accordance relevant NSW Environment Protection Authority (EPA) guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	EIS W11 EIS TB8	– AIE Construction Manager – AIE HSE Manager – Principal Contractor Environmental Rep	Refer to Emergency Spill Plan	Applicable
An emergency spill kit will be kept on site at all times. All staff will be made aware of the location of the spill kit and trained in its use.	EIS W12 EIS TB9	– AIE Construction Manager – AIE HSE Manager – Principal Contractor Environmental Rep	Refer to Emergency Spill Plan	Applicable
Machinery will be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	EIS W13 EIS TB11	– AIE Construction Manager – Principal Contractor Construction Foreman	Refer to Emergency Spill Plan	Applicable

Requirement	Reference	Responsibility	Evidence	Applicability to this FFMP
Works to remove the current quay wall and piles will commence after a visual inspection for protected mobile fauna (e.g. Syngnathids). If present, these will be relocated to adjacent habitats, outside the zone of influence by the proposed works, where feasible. Dredging will be carried out using mechanical backhoe dredge, split barges and supporting tug vessels, as opposed to suction-style dredging, to minimise the potential mobilisation of sediments within the Inner Harbour. Disposal of the dredged material will be limited to the Outer Harbour disposal area within the perimeter bund.	EIS ME1			Not applicable
The following controls should be implemented prior to dredge activities: – Physical controls such as installation of silt curtains prior to commencement of construction works would be adequate in minimising the spread of any sediments within the water column at the dredging and disposal locations. – Dredging techniques that minimise sediment resuspension during excavation and disposal (such as using mechanical methods over hydraulic methods) should be implemented throughout the project. Barge loads will also be controlled such that overflow of barge loads is avoided. – Screening technologies will be implemented to ensure that any contaminated sediments are disposed of responsibly. Contaminated dredge material will be placed such that it may be capped by uncontaminated material in accordance with a dredge management plan. – Implementation of a water quality monitoring program to ensure construction works do not exceed the project's agreed marine water quality criteria. – Daily visual observations of any potential toxic dinoflagellate blooms within the Inner Harbour.	EIS ME2			Not applicable
During piling activities, the following standard operational procedures are to be implemented (DPTI, 2012): – Pre-start procedure – The presence of marine mammals should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the soft start procedure. Particular focus should be put on the shut-down zone but the observation zone should be inspected as well, for the full extent where visibility allows. Observations should be made from the piling rig or a better vantage point if possible. – Soft start procedure – If marine mammals have not been sighted within or are likely to enter the shut down zone during the pre-start procedure, the soft start procedure may commence in which the piling impact energy is gradually increased over a 10-minute period. The soft start procedure should also be used after long breaks of more than 30 minutes in piling activity.	EIS ME4			Not applicable

Requirement	Reference	Responsibility	Evidence	Applicability to this FFMP
Visual observations of marine mammals within the safety zones should be maintained by trained crew throughout soft starts. The soft start procedure may alert marine mammals to the presence of the piling rig and enable animals to move away to distances where injury is unlikely. – Normal operation procedure – If marine mammals have not been sighted within or are not likely to enter the shut down or observation zone during the soft start procedure, piling may start at full impact energy. Trained crew should continuously undertake visual observations during piling activities and shut-down periods. After long breaks in piling activity or when visual observations ceased or were hampered by poor visibility, the pre-start procedure should be used. Night-time or low visibility operations may proceed provided that no more than three shut-downs occurred during the preceding 24 hour period. – Stand-by operations procedure – If a marine mammal is sighted within the observation zone during the soft start or normal operation procedures, the operator of the piling rig should be placed on stand-by to shut-down the piling rig. An additional trained crew member should continuously monitor the marine mammal in sight. – Shut-down procedure – If a marine mammal is sighted within or about to enter the shutdown zone, the piling activity should be stopped immediately. If a shut-down procedure occurred and marine mammals have been observed to move outside the shut-down zone, or 30 minutes have lapsed since the last marine mammal sighting, then piling activities should recommence using the soft start procedure. If marine mammals are detected the shut-down zone during poor visibility, operations should stop until visibility improves.				
Vessel and heavy machinery should be maintained in accordance with the manufacturer specifications to reduce noise emissions.	EIS ME5			Not applicable
The interaction of all vessels with cetaceans and pinnipeds will be compliant with Part 8 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000). The Australian Guidelines for Whale and Dolphin Watching (DoEE, 2017) for sea-faring activities will be implemented across the entire project. This includes the implementation of the following guidelines: – Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. – Caution zone must not be entered when calf (whale or dolphin) is present – No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod, or follow directly behind – If there is a need to stop, reduce speed gradually – Do not encourage bow riding – If animals are bow riding, do not change course or speed suddenly	EIS ME6			Not applicable

Requirement	Reference	Responsibility	Evidence	Applicability to this FFMP
Locally sourced vessels (within NSW waters) to complete the construction works, where possible International vessels to empty ballast water in accordance with the latest version of the Australian Ballast Water Management Requirements (DAWR, 2017) If an IMP is identified or suspected, then the contractor is obliged to immediately (within 24 hours) notify the NSW Department of Primary Industries Aquatic Biosecurity Unit hotline on (02) 4916 3877 Project activities to adhere to the National System for the Prevention and Management of Marine Pest Incursions (National System) and NSW requirements for IMP identification and management.	EIS ME9			Not applicable
In accordance with the offset rules established by the Biodiversity Conservation Regulation 2017 there are various means by which the offset obligations can be met. The following is recommended: – Secure and retire appropriate credits from stewardship site/s that fit within the trading rules of the BOS in accordance with the 'like-for-like' report generated by the BAM calculator. If the required credits are unavailable, source credits in accordance with the 'variation report' generated by the BAM calculator. – Only consider a payment to the Biodiversity Conservation Fund if a suitable number and type of biodiversity credits cannot be secured from third parties.	EIS TB1			Not applicable – completed pre-construction
Staff will be inducted and informed of the limits of clearing and the areas of vegetation to be retained.	EIS TB2			Not applicable
A trained ecologist is to be present for construction activities that may impact frog habitat which includes dewatering / removal of detention basins and trenching immediately adjacent to Typha drainage line (west of Springhill Road) Temporary frog-proof fencing should be installed around drill sites, roadside drains and detention ponds near the project site to be retained to prevent frogs from being injured or killed by equipment Any frogs identified will only be handled by an ecologist or wildlife rescue representative Any Green and Golden Bell Frogs or other resident frogs are to be handled in accordance with the Chytrid fungus hygiene protocols (DECC 2008c) and released into the most appropriate nearby habitat area	EIS TB3	– AIE HSE Manager – Principal Contractor Environmental Rep – Project Ecologist	Section 8.1 Section 8.2 Appendix B	Applicable for detention basins/ movement corridor within MBD Site Compound.
The trench is to be covered at night to prevent fauna from falling in An inspection is to be conducted each morning to check the trench for frogs				Not applicable

Requirement	Reference	Responsibility	Evidence	Applicability to this FFMP
Priority weed control measures will be implemented as part of the EMS to prevent their spread in the study area	EIS TB4	– AIE HSE Manager – Principal Contractor Environmental Rep	Section 8.4	Applicable
Declared priority weeds will be managed according to requirements of the NSW Biosecurity Act 2015 Soil material and stripped groundcover vegetation with the potential to contain priority weeds will not be removed from the project site Soil disturbance will be avoided as much as possible to minimise the potential for spreading weeds.	EIS TB5	– AIE HSE Manager – Principal Contractor Environmental Representative	Section 8.4 Also refer to Erosion and Soil Control Protocol (ESCP)	Applicable
Areas disturbed during the works will be rehabilitated, including stabilising disturbed soils to resist erosion and weed invasion via establishment of with a suitable turf species such as a native Couch or repaving roads and sealed surfaces. Stabilisation activities will be carried out progressively to limit the time disturbed areas are exposed to erosion processes Activities with a risk of soil erosion such as earthworks will not be undertaken immediately before or during high rainfall or wind events.	EIS TB7	– AIE HSE Manager – Principal Contractor Environmental Rep	Refer to ESCP	Applicable
Any herbicides used for weed control will be applied to the manufacturer's specifications and as outlined in the manufacturer’s Material Safety Data Sheet	EIS TB10	– AIE HSE Manager – Principal Contractor Environmental Rep	Section 8.4	Applicable
Vehicle wash down facilities will be provided should evidence of pathogens or fungus such as Phytophthora or Chytrid be found.	EIS TB12	– AIE HSE Manager – Principal Contractor Environmental Rep – Subcontractors and construction personnel	Section 8.4	Applicable

6. Existing environment

The Project site is highly modified and disturbed from historical and current industrial and port activity. The surrounding environment comprises urban development. Stage 2A works as described in Section 2 will be undertaken on the MBD Site Compound with fill materials transported to the Emplacement Cell Construction Site (refer to Figure 2.2). The MBD Site Compound is located within the PKCT and as a result is highly modified. The MBD Site Compound is largely comprised of concrete or gravel surfaces with minimal biodiversity values present.

The Biodiversity Assessment undertaken for the PKGT EIS (GHD, 2018b) surveyed the existing flora and fauna species within the site to assess the potential construction impacts on identified biota.

6.1 Flora communities

Native vegetation has been entirely removed from the MBD Site Compound. No Threatened Ecological Communities (TECs), Plant Community Types or threatened flora species have been identified within the Stage 2A construction footprint and are unlikely to occur given the disturbed nature and absence of natural soil profile.

The MBD Site Compound is primarily hardstand with limited vegetation present. The vegetation that is present comprises non-native vegetation which provides limited habitat resource, does not form a functioning or self-sustaining ecosystem, and is significantly fragmented. Vegetation mapping classifies the vegetation present as ‘Disturbed landscapes’ – ‘Weeds and Exotics’, ‘Cleared lands’ or ‘Modified lands’ (NPWS, 2002).

6.2 Fauna species

The field survey identified 25 fauna species in the Project area, comprising 23 bird species, one mammal species and one frog species. No threatened or migratory species were recorded during site investigations (GHD, 2018a).

The MBD Site Compound provides limited habitat resources for fauna species. The hardstand areas and artificial sediment ponds located throughout the site provide limited and minimal habitat for potential threatened species.

Green and Golden Bell Frogs are a threatened species that has been previously recorded in the area surrounding Port Kembla (refer to Figure 6.1). They are listed as endangered under the BC Act and vulnerable under the EPBC Act. Green and Golden Bell Frogs are known to occur in highly disturbed environments with moderate surface water contamination conditions, such as those described on the MBD Site Compound.

A potential movement corridor for the Green and Golden Bell Frog has been identified on the MBD Site Compound (refer to Figure 6.1). Within this area, up to four artificial detention ponds will be removed during the Stage 2A construction works which provides potential habitat and connectivity for the Green and Golden Bell Frog. Potential impacts related to the scope of works for Stage 2A are detailed in Section 7.

Figure 6.1 Green and Golden Bell Frog Habitat

6.3 Weed species

Several weed species, including Weeds of National Significance, occur within the MBD Site Compound. A list of weeds recorded within the entire Project area, priority weeds of concern that pose potential biosecurity risk, and the applicable Biosecurity Act requirements is included in Appendix C.

7. Potential impacts

7.1 Flora communities

No impacts to native vegetation or TECs are anticipated during Stage 2A due to the MBD Site Compound being devoid of any native vegetation or known threatened flora species.

7.2 Terrestrial fauna

Potential direct and indirect impacts on terrestrial fauna during Stage 2A are as follows:

– Direct mortalities and injuries to native fauna during construction or traffic movements.
– Loss of potential habitat/movement corridor for the Green and Golden Bell Frog.
– Temporary increased noise levels from construction equipment, leading to disturbance of fauna, especially during breeding seasons.
– Sedimentation, pollution, contaminated run off or erosion within the construction corridor and adjoining native vegetation and aquatic habitats, through soil disturbance and construction activities.

7.3 Marine fauna

No impacts to marine fauna are anticipated during Stage 2A due to the construction works being land based activity only. Potential impacts related to spills to the Port Kembla waters are addressed in the Stage 2A Emergency Spill Plan.

7.4 Introduction of weed species and pathogens

7.4.1 Weeds

There is a potential to introduce new weeds to the site from the transportation and movement of personnel, materials, machinery, and equipment. Similarly, there is also the potential to impact native vegetation in the vicinity of the site through the dispersal of weed propagules carried on vehicles moving to/from the site.

7.4.2 Pathogens

Construction activities have the potential to introduce or spread pathogens throughout the Project site through disturbance and increased visitation numbers. Pathogens that could be potentially introduced or spread include:

– Phytophthora (*Phytophthora cinnamomi*).
– Myrtle Rust (*Uredo rangelii*).
– Chytrid fungus (*Batrachochytrium dendrobatidis*).

Phytophthora and Myrtle Rust may result in the dieback or modification of native vegetation and damage to fauna habitats. Chytrid fungus affects both tadpoles and adult frogs and can lead to the extinction of local populations once introduced into an area (GHD, 2018b).

The potential for impacts associated with these pathogens is low, given the existing modified nature of the MBD Site Compound, high visitation rates to the site, limited intact native vegetation and habitats within the Stage 2A works footprint.

8. Environmental management

This section provides a description of the steps and procedures required to protect native flora and fauna species and avoid the introduction and spread of weeds and/or pathogens during Stage 2A.

8.1 Green and Golden Bell Frog

The following management actions are to be implemented to minimise the risk to the Green and Golden Bell Frog that may be present within the MBD Site Compound:

– Establish temporary frog-proof fencing around the MBD Site Compound northern boundary. The purpose of these fences is to prevent frogs from entering the MBD Site Compound.
– Undertake pre-clearance surveys immediately prior to construction works being undertaken within identified movement corridor of Green and Golden Bell Frog– (refer to Figure 6.1).
– Should Green and Golden Bell Frogs be encountered, process as per the measures in Section 8.3. Ensure Green and Golden Bell Frogs are handled by an experienced handler and in accordance with the *Hygiene protocols for the control of disease in frogs* (DECC, 2008) (refer to Appendix B). Release into known, nearby habitat for Green and Golden Bell Frog.
– Ensure all staff inductions include a relevant section on the Green and Golden Bell Frog. The induction should include:
    - What to do in the event of unexpected finds of frogs within the construction zone.
    - Hygiene protocols for the handling of Green and Golden Bell Frogs.
– Implement a stop work or unanticipated find procedure for when Green and Golden Bell Frogs are observed within the construction zone.

8.2 Other fauna

The following management actions are to be implemented to minimise the risk to other fauna species that may be present within the MBD Site Compound:

– Undertake pre-clearance surveys immediately prior to construction works being undertaken.
– Cover excavations for cable trenching at the end of the day to prevent ground-dwelling fauna species falling in overnight.
– Check excavations for cable trenching each morning prior to the start of construction works for the presence of any fauna that may have fallen in overnight.
– Should fauna be encountered, process as per the measures in Section 8.3.
– Establish procedure for injured wildlife.
– Ensure handling of fauna is only undertaken by Project Ecologist.

8.3 Fauna encountered on-site

Should an animal be observed in the vicinity of the construction works and where an animal may be at risk of injury from works or becomes stuck within the live work area, the following procedure should be followed:

– Stop work and contact the Principal Contractor Environment Representative and Project Ecologist.
– The Project Ecologist shall determine if the animal is at risk of being harmed:
    - If yes, all works in the vicinity of the animal should be halted (works may continue in other areas of the site). Project Ecologist is to conduct a “catch and release” to safely remove the animal from harm.
    - If the animal is not at risk of being harmed and can move on of its own accord, then works should be halted in the vicinity of the animal until it moves on (works may continue in other areas of the site). If the animal is not capable of moving on of its own accord, the Project Ecologist will determine the appropriate action required.

A Fauna Register will be maintained that records all fauna interactions including:

– Date.
– Species.
– Condition.
– Status.
– Location (found and relocated).
– Habitat found in.
– Habitat relocated to.
– Treatment required.
– Details regarding any animal death or injury due to any construction activity.
– Outcome/treatment.

A copy of the Fauna Register is included in Appendix D.

8.4 Weed and pathogen management

Weed and hygiene management will be undertaken in accordance with the *Hygiene guidelines protocols to protect priority biodiversity areas in NSW from Phytophthora cinnamomi, myrtle rust, amphibian chytrid fungus and invasive plants* (DPIE, 2020) (refer to Appendix E). The following mitigation measures will be implemented to manage the potential impacts related to weed and pathogens at the MBD Site Compound:

– Develop a Weed Hygiene register to record the following protocols for weed hygiene:
  - Inspection and verification of cleanliness for all site plant and equipment prior to MBD Compound Site entry, including date of clean down/inspection prior to mobilisation.
  - Develop and maintain a register of vehicles, machinery and equipment that have been inspected and/or cleaned.
– Undertake treatment and/or removal and disposal prior to commencement of ground clearing activities.
– Manage identified priority weeds according to the requirements of the Biosecurity Act (refer to Appendix C).
– Stockpile any weed-infested material separately to vegetation and topsoil that is free of weeds.
– Apply herbicides used for weed control to the manufacturer's specifications and as outlined in the manufacturer's Safety Data Sheet.
– Provide vehicle wash down facilities should evidence of pathogens or fungus such as Phytophthora or Chytrid fungus be detected.
– Implement erosion and sediment control measures outlined in the Stage 2A ESCP, included in the Stage 2A Spoil Management Plan.

9. Communication and complaints

Effective communication between the Project Director, Project team, contractors and external stakeholders will be undertaken throughout the Project to ensure effective implementation of this FFMP.

Project communication can be categorised into internal and external communications, as well as communications specifically dealing with complaints. The specific communication methods for each category are discussed below.

9.1 Internal communications

Communication on environmental issues related to flora and fauna management within the Project team will be maintained, as a minimum, through the following forums (organiser as noted):

– Weekly project construction team meetings (AIE Construction Manager or delegate).
– Weekly Environmental management team meetings with relevant contractors (AIE HSE Manager or Delegate).
– Toolbox talks and daily pre-start briefings (Principal Contractor Project Manager or delegate).
– Minutes of formal meetings will be taken and distributed to record issues raised and actions required, with action status established at subsequent meetings.
– Monthly review of the internal AIE Environmental Compliance Tracking register (AIE HSE Manager or delegate).

All internal meetings include appropriate documentation in the form of agenda and formal distribution via the Project's document system.

In addition to the above, the AIE Environment Team will also undertake informal planning sessions and resource review meetings to plan and forecast for upcoming key construction dates, critical issues and other relevant matters associated with environmental planning and approvals.

9.2 External communications

AIE is committed to keeping the local community and relevant agencies informed about the development of the Project. The principal external communication objectives are, therefore, to:

– Continue to maintain open communication with relevant stakeholders.
– Minimise environmental impacts.
– Be proactive in addressing any concerns that the community / external stakeholder may express.

AIE will build upon the stakeholder and community engagement phase undertaken during project development including multiple group or one on one briefings. A project website (www.ausindenergy.com) has been developed and provides comprehensive, clear, and accessible information that is updated on a regular basis.

As well as the local Port Kembla and broader community of the Wollongong region, extensive engagement was also undertaken with a range of other interested key stakeholders, such as local commerce organisations, the Port Authority of NSW and local and state government.

Consultation with key stakeholders and the wider community on the Project will continue throughout Stage 2A and subsequent construction phases. These measures will ensure the stakeholders, including the wider community, remain informed of the project's progress.

Key methods of engagement are provided in the Stage 2A EMS.

9.3 Complaints management

All complaints where a third party has identified a construction activity as being unsatisfactory or unacceptable will be dealt with promptly and efficiently in accordance with the complaint and dispute response outlined in the Project's Stage 2A EMS.

AIE will operate a free 24-hour Community Information Line (1800 789 177) where members of the community can leave details about an inquiry, they may have regarding construction activities related to flora and fauna. This message will be passed on to site personnel and/or the Stakeholder Engagement Team, as appropriate.

Initial responses to complaints will be provided within 24 hours of the complaint being received. As part of the response, a review of the activity will be undertaken. If required and possible, immediate changes will be made to reduce any impact on the community. In some cases, the issues cannot be resolved immediately, and ongoing actions might be required to resolve the issue.

All complaints related to flora and fauna will be recorded in a Complaints and Disputes Register. The following information will be recorded for each complaint:

1. The date and time of the complaint.
2. The method by which the complaint was made.
3. Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.
4. The nature of the complaint.
5. The action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant.
6. If no action was taken by the licensee, the reasons why no action was taken.

The Complaints and Disputes Register will be maintained by the Project's HSE Manager or delegate, and will detail what the issue was, initial response provided, how and when the issue was resolved, and by whom.

Where resolving a complaint with a third party is protracted or develops into a dispute, the AIE HSE Manager shall escalate proactively to Senior Project Leadership (e.g., AIE Project Manager and/or Project Director) to assist with resolution. AIE will work proactively with the complainant to resolve the dispute including having face to face meetings, site familiarisation sessions and agreeing on actions to resolve the dispute. All communications and agreed actions shall be documented.

For the management and reporting of corrective actions (which may be required in response to a complaint), refer to the Project's Stage 2A EMS.

10. Inspections, monitoring and audits

Monitoring and auditing will be undertaken to determine the impact on the environment and identify opportunities for improvement. Monitoring to be implemented for specific actions or environmental issues (e.g., water quality monitoring, air quality monitoring) will be detailed in their relevant sub-plan and will specifically address the monitoring requirements for those issues.

10.1 Environmental inspections

10.1.1 AIE and Principal Contractor joint environmental weekly inspection

As a minimum, the AIE HSE Manager (or nominated delegate) will undertake weekly inspection of the work sites with the relevant Principal Contractor's environmental personnel (Environmental Representative or similar) to evaluate the effectiveness of environmental controls (inclusive of erosion and sediment control measures) and general compliance with the implementation of the FFMP for site-based activities.

If any maintenance and/or deficiencies in environmental controls or in the standard of environmental performance are observed, they will be recorded on the checklist form. Records will also include details of any maintenance required, the nature of the deficiency, any actions required and an implementation priority.

Actions raised during inspections will be documented on the *Weekly Environmental Site Checklist* and will be issued formally through the Project's document management system to the relevant Contractor for action. If they represent an actual or potential significant environmental risk, these issues shall be reviewed at the Project Planning meetings and will have non-conformances raised if not closed out in the nominated timeframe (Nonconformance Report).

10.1.2 Contractor environmental inspections

In addition to the joint weekly environmental site inspection with AIE, the Principal Contractor will be required to undertake daily site environmental inspections, targeting key environmental risks commensurate with the activity being undertaken. The daily environmental site inspection will be documented on a checklist, or similar, to be prepared and completed by the Principal Contractor.

Copies of the daily environmental site inspection records are to be provide to AIE on request.

The HSE Manager is responsible for the initial reporting of significant non-compliances with the FFMP or relevant legislation to the AIE Project Director and government authorities (refer to Section 11).

10.2 Monitoring

Monitoring will be undertaken to validate the impacts predicted for the work, to measure the effectiveness of management plans, environmental controls, and implementation of this FFMP, and to address approval requirements.

As part of the daily monitoring, the AIE Environmental Representative will conduct visual inspections for any Green and Golden Bell Frogs and other ground dwelling fauna in the potential movement corridor in the MBD Site Compound (refer to Figure 6.1).

Monitoring of flora and fauna management and mitigation measures will be undertaken as required by the Project Manager, Site Supervisor, HSE Representative/ Project Ecologist prior to, during and following construction.

If any threatened fauna species are observed during Stage 2A, the environmental representative will record the location and immediately contact the Project Ecologist and report the presence, location, and condition of the threatened species in question. Record is then to be made in the Fauna Register (refer to Appendix D).

10.3 Auditing

AIE will conduct internal audits at frequencies as determined in the risk-based auditing schedule. The purpose of auditing is to verify compliance with:

– The EMS and this FFMP.
– Compliance with the requirements of relevant components outlined within the EMS and FFMP, including but not limited to, site inspection compliance, document control / management, non-compliance, and incident management etc.
– Monitoring and reporting requirements as set out under EPL No. 21529.

Additional details regarding the auditing process are detailed in the Project's Stage 2A EMS.

10.4 Environmental reporting

10.4.1 DPIE reporting

Regular reports on compliance and other matters will be provided during the construction phase of the Project. This will include reporting to the Department of Planning, Industry and Environment (DPIE) in accordance with Schedule 4, Conditions 7 and 8 of the Infrastructure Approval (SSI 9471), with specific reference to the *Compliance Reporting Post Approval Requirements* (2020).

In addition, DPIE will be notified in writing of the date of commencement of each of the relevant phases of the Project in accordance with Schedule 2, Condition 8 of the Infrastructure Approval (SSI 9471).

Reporting applicable to this FFMP will consist of:

– Fauna species encountered during Stage 2A.
– Construction works progress and appraisal of fauna and weed controls.
– Environmental Incident Report(s), as required.

10.4.2 Other reporting requirements

A monthly environmental monitoring report will be developed for each calendar month which will include details of the monitoring results and frequencies and inclusion of any exceedance of EPL No. 21529 limits / criteria. A copy of the monthly environmental monitoring report will be made available on the AIE Project website.

Further reporting requirements are provided in Section 10.6 and Section 11.

10.5 Compliance tracking register

A Compliance Tracking Register has been developed as a monitoring tool to assist with the compliance reporting requirement as set out under Condition 7, Schedule 4 of the Infrastructure Approval (SSI 9471) as follows:

Compliance Reporting

The proponent must provide regular compliance reports to the Department on the development in accordance with the relevant requirements of the Department's guideline Compliance Reporting Post Approval Requirements (2020), or its most recent edition.

The compliance tracking register includes a breakdown of the requirements from the following key approval and project documents:

– Infrastructure Approval (SSI 9471).
– EPL No. 21529.
– Requirements of this FFMP.

The Compliance Tracking Register includes tabulation of reference conditions, the requirements, responsibility, status (i.e., ongoing, close-out, not triggered, etc.) and supporting evidence where required.

A routine review of the Compliance Tracking Register is undertaken by the AIE HSE Manager (or delegate) with input sought from the relevant contractors as required. The Compliance Tracking is a live document which is kept up to date for each stage of the construction works.

10.6 Non-conformance, corrective, and preventative actions

Non-conformances or potential non-conformances are situations or events that do not comply with the safeguards and procedures stipulated in the EMS or this FFMP:

– As part of site inspections, supervision or monitoring of construction activities.
– During internal audits.
– Following justified / supported verbal or written third party complaints.

All non-conformances related to flora and fauna will be managed and reported using the non-conformance function of the Project's document management system. Each non-conformance event and follow-up action will be documented and traceable, including identification of key dates and responsible personnel.

Additional details regarding corrective and preventative actions are outlined in the Project's Stage 2A EMS.

The Department must be notified in writing to compliance@planning.nsw.gov.au within 7 days after the identification of any non-compliance issue. The notification must identify the development, including the application number, set out the condition of approval that the development is non-compliant with, the way in which it does not comply, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non -compliance.

11. Incident management and emergency response

11.1 Incident management

11.1.1 Overview

Incidents are defined as an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance. The consequences of such incidents may result in material environmental harm, damage, or asset loss. 'Near misses' are extraordinary events that could have reasonably resulted in an incident.

All incidents related to flora and fauna, including those of the Principal Contractor, its subcontractors, and visitors that occur during the undertaking of the construction works for the Project will be managed to satisfy the requirements of AIE's Incident Reporting and Investigation System Requirements. Whilst it is noted that key Contractors will be implementing their own environmental management system procedures and processes, AIE will be responsible for ensuring that these systems and processes satisfy the requirements of the AIE EMS, including the incident management components. The Principal Contractor will be responsible for providing all necessary documentation with regards to the incident investigation and close-out actions where required. The timing of the provision of this documentation is to align with the AIE requirements.

The AIE HSE Manager must be notified immediately of any environmental incident or near miss related to flora and fauna. These may include, but are not limited to the following:

– Exceedance of monitoring criteria as required under the Project EPL (EPL No. 21529).
– Spill of any dangerous goods or hazardous substance to ground or water.
– Substantiated complaints received from members of the community or regulatory authorities.
– Regulatory breaches such as fines, prosecutions, improvement notices, breaches of licence conditions.
– All incidents of third-party property damage or loss.
– Incidents involving impact or potential damage to items or places of cultural heritage significance.
– Land-based off-site sediment loss to the environment, including sediment tracking onto the roadway.

The AIE HSE Manager will be responsible for regulatory notification of all notifiable environmental incidents (refer to Section 11.1.2 for notifiable incidents). All environmental incidents will be reported immediately to DPIE in writing via the Planning Portal after AIE becomes aware of the incident, as per Schedule 4 Condition 5 of the Infrastructure Approval (SSI 9471). The notification must identify the development, including the application number, and set out the location and nature of the incident.

In the event of a notifiable non-compliance incident arising, the Principal Contractor will notify the AIE HSE Manager immediately to allow the AIE HSE Manager to notify DPIE in writing (via the Planning Portal) within 7 days of AIE becoming aware of the non-compliance, as per Schedule 4 Condition 6 of the Infrastructure Approval (SSI 9471).The notification must identify the development, including the application number, set out the condition of approval that the development is non-compliant with, the way in which it does not comply, the reasons for the non- compliance (if known) and what actions have been taken, or will be taken, to address the non- compliance.

11.1.2 Notifiable incident under the POEO Act

In the event of a Notifiable Incident as defined under the POEO Act, AIE is responsible for immediately notifying the EPA, and any other relevant authority, of pollution incidents on or around the site via the EPA Environment Line (telephone 131 555) in accordance with Part 5.7 of the POEO Act. The circumstances where this will take place include:

– *If the actual or potential harm to the health or safety of human beings or ecosystems is not trivial.*

– *If actual or potential loss or property damage (including clean-up costs) associated with an environmental incident exceeds $10,000.*

Follow-up written notification to the EPA and any other relevant authorities will be required in accordance with the POEO Act and requirements of the EPA. This includes the provision of written details of the notification to the EPA within 7 days of the date on which the incident occurred.

All notifiable incidents will also be managed, documented, and reported in accordance with the AIE *Incident Reporting and Investigation System Requirement*.

In addition, an authorised officer of the EPA has the right to request a written report (in accordance with Condition R3 of the EPL No. 21529) if they suspect on reasonable grounds that an event has occurred at the licensed premises which has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies). The written report is to address all the requirements under Condition R3 of the EPL.

11.1.3 Notifiable incident under the Infrastructure Approval (SSI-9471)

In accordance with Condition 5 of Schedule 4, DPIE must be notified in writing to compliance@planning.nsw.gov.au immediately after AIE becomes aware of an incident on site.

Additional details regarding notifiable incidents and procedures are outlined in the Project's Stage 2A EMS.

11.2 Emergency response

Actual or potential emergency situations will vary in type and severity. The required level of response and notification will be at the discretion of the AIE Construction Manager in consultation with the AIE HSE Manager.

Any emergency situation may require only isolated containment and control or may require the complete evacuation of the site and notification of relevant emergency services. Consideration should be made of the response requirements for different situations. If at any time there is uncertainty on how to proceed, response should be for the worst possible scenario. Ultimately, the AIE Construction Manager or representative has authority and responsibility to instigate an evacuation if he/she feels it is warranted.

In the event of an emergency, the following plans shall be consulted and implemented, as relevant:

– The Principal Contractor's site-specific Emergency Response Plan.
– AIE Port Kembla Gas Terminal Emergency Spill Plan.
– Pollution Incident Response Management Plan (PIRMP).
– AIE Emergency Management Procedures.

12. Document management and review

12.1 Record management

Records and registers specified in this FFMP for Stage 2A shall be maintained. Records to be kept may include but will not be limited to the following:

- Environmental Inspection Checklist.
- Environment Reporting.
- Environmental Monitoring Reports / Records.
- Fauna and Weed Register.
- Internal Audit Reports.
- Incident Reports and Register.
- Toolbox Talk Records.
- Induction Presentation and Register.
- Environmental Activities Safe Work Method Statement (SWMS).
- Corrective Actions Register.
- Waste and Resource Register.
- Material Tracking Register.
- Training Register / Matrix.
- Complaints Register.

12.2 Review and revision of the FFMP

This FFMP will be reviewed and updated, as required under Condition 3 of Schedule 4 of Infrastructure Approval (SSI 9471) to ensure the objectives of the applicable approval conditions contained within are being met throughout Stage 2A.

In addition, as required under Condition 4 of Schedule 4 of Infrastructure Approval (SSI 9471), the FFMP must be reviewed, and if necessary, revised within 3 months (unless otherwise agreed with DPIE) for any of the following:

- Following the submission of an incident report as per Condition 5, Schedule 4 4 of Infrastructure Approval (SSI 9471) (refer to Section 11).
- Following approval of any modification to the conditions of approval outlined in Infrastructure Approval (SSI 9471).
- At the direction of the Planning Secretary as per Condition 4, Schedule 2 4 of Infrastructure Approval (SSI 9471).

12.3 Access to information

AIE will make the following information publicly available on the PKGT website, as per Schedule 4, Condition 12 of the Infrastructure Approval (SSI 9471) and the requirements as set-out under the Project EPL (No. 21529):

- The PKGT EIS.
- Current statutory approvals for the Project.
- Approved strategies, plans or programs required under the conditions of Infrastructure Approval (SSI 9471).
- A comprehensive summary of the monitoring results of the development, reported in accordance with the specification of any conditions, or any approved plans and programs relating to Infrastructure Approval (SSI 9471).
- A summary of complaints (updated monthly).
- Any independent environmental audit, and responses to the recommendations in any audit.

– The approved premises map (EPL No. 21259, Condition A2.4).
– PIRMP (EPL No. 21529, Condition E2).
– Any other matter required by the Planning Secretary.

This information will be kept up to date by AIE when required.

.

References

DPIE 2020, *Compliance Reporting Post Approval Requirements*.

Environmental Protection Licence No. 21529, dated 5 October 2021.

GHD 2018a, Port Kembla Gas Terminal Environmental Impact Statement.

GHD 2018b, Port Kembla Gas Terminal EIS Terrestrial Ecology Assessment.

Infrastructure Approval SSI 9471 dated 24th April 2019.

NSW National Parks and Wildlife Service 2002, *Native Vegetation of the Illawarra Escarpment and Coastal Plain*. (Mapping updated by Wollongong City Council in 2014.)

South East Local Land Services 2017, S*outh East Regional Strategic Weed Management Plan 2017 – 2022*.

Appendices

Appendix A

Biodiversity credits retirement certificate

Statement confirming payment into the Biodiversity Conservation Fund for an offset obligation

Pursuant to section 6.33 of the *Biodiversity Conservation Act 2016*, the NSW Biodiversity Conservation Trust confirms that the following payments have been made into the Biodiversity Conservation Fund under section 6.30(1) of the Act to satisfy an obligation to retire biodiversity credits.

Payment made by:	Australian Industrial Energy Pty Ltd				
Date received:	12 April 2021				
NSW statutory obligation reference[1]	SSI 9471				
Commonwealth EPBC Act controlled action reference (if applicable)[2]	NA				
BCT Reference	BCF186				
Biodiversity credit retirement obligations satisfied by payment to the Biodiversity Conservation Fund:					
Biodiversity credit type (Credit ID and name)	**Offset trading group**	**EPBC Act Controlled Action offset obligation (Y / N)**	**Number of credits**	**Cost per credit (Exc. GST)**	**Total payment per credit type (Exc. GST)**
1326 - Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Coastal Valley Grassy Woodlands greater than or equal to 90% cleared	N	3	$17,568.69	$52,706.08
10483 – Litoria aurea (Green and Golden Bell Frog)	Litoria aurea (Green and Golden Bell Frog)	N	1	$7,449.44	$ 7,449.44
10549 - Myotis macropus (Southern Myotis)	Myotis macropus (Southern Myotis)	N	2	$974.69	$ 1,949.37
Total (Exc. GST)					**$62,104.89**
GST					**$ 6,210.49**
Total (Inc. GST)					**$68,315.38**

Emily McCosker

Director Strategy & Finance

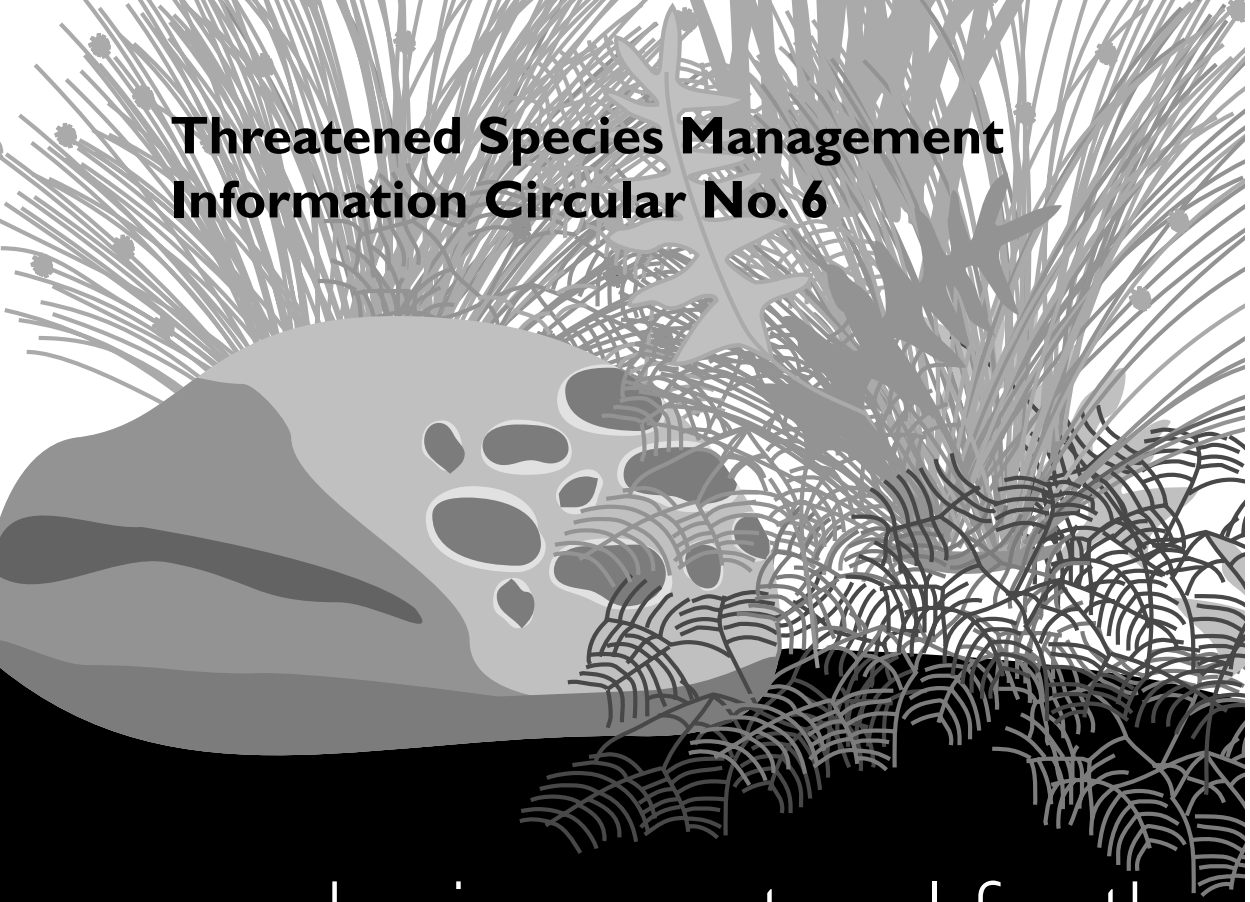
[1]This refers to either; a development application number for a development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**), a State significant infrastructure approval under the previous Part 5.1 (now Part 5, Division 5.2) of the EP&A Act, a decision of a determining authority to carry out or approve the carrying out of an activity under Part 5 of the EP&A Act, or a biobank statement number or biodiversity certification number.

[2] This refers to a controlled action under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* for which a biodiversity offset obligation has been met through payment into the BCF.

Appendix B

Frog hygiene protocol

Threatened Species Management Information Circular No. 6



hygiene protocol for the control of disease in frogs

April 2008

Department of **Environment & Climate Change** NSW

* The National Parks and Wildlife Service is part of the Department of Environment and Climate Change

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Website: www.environment.nsw.gov.au

This document can be sourced from the DECC website:
www.environment.nsw.gov.au/resources/nature/hypfrog.pdf

This document should be cited as:
Department of Environment and Climate Change (NSW) 2008.
Hygiene protocol for the control of disease in frogs.
Information Circular Number 6. DECC (NSW), Sydney South.

ISBN 0 7313 6372 8
DECC 2008/199

Acknowledgments

NSW National Parks and Wildlife Service Declining Frog Working Group who recommended the preparation and provided input into the development of this strategy.

Ross Wellington and Ron Haering (both DECC) the authors of this document.

Thanks to Jack Baker, Lee Berger, Mark Endersby, Jeff Hardy, Frances Hulst, Alex Hyatt, Keith McDougall, Diana Mendez, Deborah Pergolotti, Graham Pyke, Marjo Rauhala, Julie Ravallion, Karrie Rose, Lothar Voigt and Arthur White for their advice and/or technical review.

This hygiene protocol is an adaptation of the Declining Amphibian Population Task Force (DAPTF) Fieldwork Code of Practice and the recommendations of Speare et al. (1999) and has drawn on recommendations from earlier guidelines prepared by Environment ACT.

Foundation for National Parks and Wildlife funded the printing of this protocol.

hygiene protocol for the control of disease in frogs

1 introduction

This information circular outlines measures to:

- Prevent or reduce disease causing pathogens being transferred within and between wild populations of frogs.
- Ensure captive frogs are not infected prior to release.
- Deal safely with unintentionally transported frogs.
- Assist with the proper identification and management of sick and dead frogs in the wild.

1.1 Who should read this document?

This protocol is intended for use by all researchers, wildlife consultants, fauna surveyors and students undertaking frog field-work. In addition, the protocol should be read by Department of Environment and Climate Change (DECC) personnel, frog keepers, wildlife rescue and carer organisations, herpetological/frog interest groups/ societies, fauna park/zoo operators/workers and other individuals who regularly deal with or are likely to encounter frogs.

This protocol outlines the expectations of the DECC regarding precautionary procedures to be employed when working with frog populations. The intention is to promote implementation of hygiene procedures by all individuals working with frogs. New licences and licence renewals will be conditional upon incorporation of the protocol. The DECC recognises that some variation from the protocol may be appropriate for particular research and frog handling activities. Such variation proposals should accompany any licence application or renewal to the DECC.

1.2 Background

1.2.1 Amphibian Chytrid Fungus

The apparent decline of frogs, including extinctions of species and local populations, has attracted increased international and national concern. Many potential causes for frog declines have been proposed (eg see Pechmann et al., 1991; Ferrero and Bergin, 1993; Pechmann and Wilbur, 1994; Pounds and Crump, 1994; Pounds et al., 1997). However, the patterns of decline at many locations suggest that epidemic disease maybe the cause (Richards et al., 1993; Laurance et al., 1996; Alford and Richards, 1997). Recent research has implicated a water-borne fungal pathogen *Batrachochytrium dendrobatidis* as the likely specific causative agent in many of these declines both in Australia and elsewhere (Berger et al., 1998; 1999). This agent is commonly known as the amphibian or frog chytrid fungus and is responsible for the disease Chytridiomycosis (Berger et al., 1999).

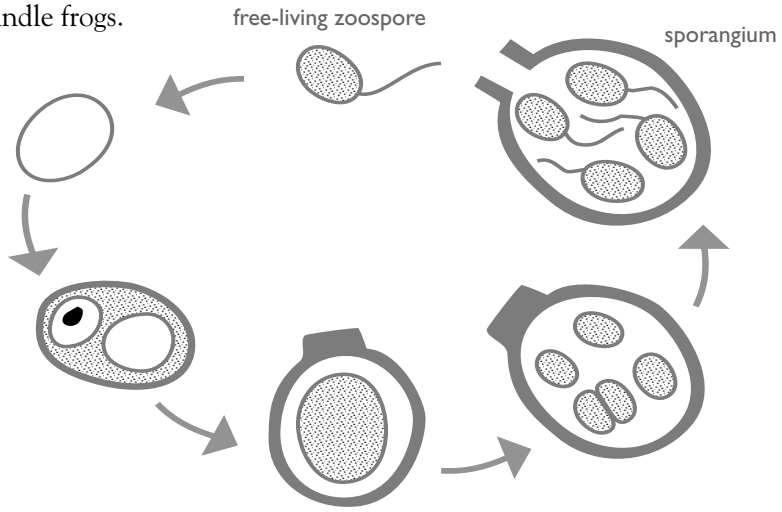
B. dendrobatidis is a form of fungus belonging to the phylum Chytridiomycota. Most species within this phylum occur as free-living saprophytic fungi in water and soil and have been found in almost every type of environment including deserts, artic tundra and rainforest and are considered important primary biodegraders (Powell 1993). *B. dendrobatidis* is a unique parasitic form of Chytridiomycete fungi, in that it invades the skin of amphibians, including tadpoles, often causing sporadic deaths with up to 100% mortality in some populations. Chytridiomycosis has been detected in over 40 species of native amphibian in Australia (Mahony and Workman 2000). However, it is not currently known whether the fungus is endemic or exotic to Australia.

The infective stage of *B. dendrobatidis* is the zoospore and transmission requires water (Berger et al.,1999). Zoospores released from an infected amphibian can potentially infect other amphibians in the same water. More research is needed on the dynamics of infection in the wild. *B. dendrobatidis* is known to be susceptible to seasonal temperature changes, dehydration, salinity, water pH, light, nutrition and dissolved oxygen (Berger et al., 1999).

1.3 Objectives

The objectives of the hygiene protocol are to:

- Recommend best-practice procedures for DECC personnel, researchers, consultants and other frog enthusiasts or individuals who handle frogs.
- Suggest workable strategies for those regularly working in the field with frogs or conducting fieldwork activities in wetlands and other aquatic environments where there is the potential for spreading pathogens such as the frog chytrid fungus.
- Provide background information and guidance to people who provide advice or supervise frog related activities.
- Provide standard licence conditions for workers engaged in frog related activities.
- Inform Animal Care and Ethics Committees (ACEC) for their consideration when granting research approvals.



Life cycle of frog chytrid fungus from infective free-living zoospore stage to sporangium (adapted from L. Berger).

2 site hygiene management

A checklist of risk management procedures and recommended standard hygiene kit is provided in Appendix 1. Please note Footnote 1 on page 4.

Individuals studying frogs often travel and collect samples of frogs from multiple sites. Some frog populations can be particularly sensitive to the introduction of infectious pathogens such as the frog chytrid fungus. Also, the arrangement of populations in the landscape may make frogs particularly vulnerable to transmission of infectious pathogens. Therefore, it is important that frog workers recognise the boundaries between sites and undertake measures which reduce the likelihood of spreading infection.

Where critically endangered species or populations of particular risk are known to occur, this protocol should be applied over very short distances ie a single site may need to be subdivided and treated as separate sites.

When planning to survey multiple sites, always start at a site where frog chytrid fungus is not known to be present before entering other infected areas.

2.1 Defining a site

Defining the boundary of a site maybe problematic. In some places, the boundary between sites will be obvious but in others, less so. Undertaking work at a number of sites or conducting routine monitoring at a series of sites within walking distance creates obvious difficulties with boundary definitions. It is likely that defining the boundary between sites will differ among localities. It may be that a natural or constructed feature forms a logical indicator of a site boundary eg a road/track, a large body of water such as a river or the sea, a marked habitat change or a catchment boundary.

As a guiding principle, each individual waterbody should be considered a separate site.

When working along a river or stream or around a wetland or a series of interconnecting ponds it is reasonable, in most instances, to treat such examples as a single site for the purposes of this protocol. Such a case would occur in areas where frogs are known to have free interchange between ponds.

Where a stream consists of a series of distinctive tributaries or sub-catchments or where there is an obvious break or division then they should be treated as separate sites, particularly if there is no known interchange of frogs between sites.

2.2 On-site hygiene

When travelling from site to site it is recommended that the following hygiene precautions be undertaken to minimise the transfer of disease from footwear, equipment and/or vehicles.

Footwear

Footwear must be thoroughly cleaned and disinfected at the commencement of fieldwork and between each sampling site.

This can be achieved by initially scraping boots clear of mud and standing the soles in a disinfecting solution. The remainder of the boot should be rinsed or sprayed with a disinfecting solution that contains *benzalkonium chloride* as the active ingredient. Disinfecting solutions should be prevented from entering any water bodies.

Rubber boots such as 'gum boots' or 'Wellingtons' are recommended because of the ease with which they can be cleaned and disinfected.

Several changes of footwear bagged between sites might be a practical alternative to cleaning.

Equipment

Equipment such as nets, balances, callipers, bags, scalpels, headlamps, torches, wetsuits and waders etc that are used at one site must be cleaned and disinfected before re-use at another site.

Disposable items should be used where possible. Non-disposable equipment should be used only once during a particular field exercise and disinfected later or disinfected at the site between uses using procedures outlined in 2.4 below.

Vehicles

Where necessary, vehicle tyres should be sprayed/flushed with a disinfecting solution in high-risk areas.

Transmission of disease from vehicles is unlikely to be a problem. However, if a vehicle is used to traverse a known frog site, which could result in mud and water being transferred to other bodies of water or frog sites, then wheels and tyres should undergo cleaning and disinfection. This should be carried out at a safe distance from water bodies, so that the disinfecting solution can infiltrate soil rather than run-off into a nearby water body.

Spraying with 'toilet duck' (active ingredient *benzalkonium chloride*) is recommended to disinfect car wheels and tyres.

Cleaning of footwear before getting back into the car will prevent the transfer of pathogens from/to vehicle floor and control pedals.

2.3 Handling of frogs in the field

The spread of pathogenic organisms, such as the frog chytrid fungus, may occur as a result of handling frogs.

Frogs should only be handled when necessary.

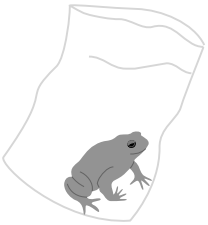
Where handling of frogs is necessary the risk of pathogen transfer should be minimised as follows:

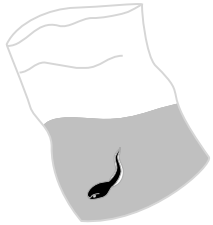
- Hands should be either cleaned and disinfected between samples or a new pair of disposable gloves used for each sample[1]. This may be achieved by commencing with a work area that has a dish containing a disinfecting solution and paper towels.
- A 'one bag – one frog' approach to frog handling should be used especially where several people are working together with one person processing frogs and others doing the collecting. Bags should not be reused.
- A 'one bag – one sample' approach to tadpole sampling should be used. Bags should not be reused.

Researchers who use toe clipping or Passive Integrated Transponder (PIT) tagging are likely to increase the risk of transmitting disease between frogs due to the possibility of directly introducing pathogens into the frogs' system. This can be minimised by using:

- Disposable sterile instruments
- Instruments disinfected previously and used once
- Instruments disinfected in between each frog

Disinfecting solutions containing *benzalkonium chloride* are readily available from local supermarkets. Some brands include Toilet Duck, Sanpic, New Clenz and Pine Clean.





[1] As a principle, this protocol assumes that not all frogs in an infected pond will be contaminated by the frog chytrid fungus. The infective load of a body of water may not be high enough to cause cross contamination of individual frogs in the same pond. Therefore care should be taken to use separate gloves and bags and clean hands for each sample, to avoid transmission of high infective loads between individuals.

Open wounds from toe clipping and PIT tagging should be sealed with a cyanoacrylate compound such as *Vetbond*© to reduce the likelihood of entry of pathogens. The DECC ACEC further recommends the application of topical anaesthetic *Xylocaine*© cream and *Betadine*© disinfectant (1% solution) before and after any surgical procedure. This should then be followed by the wound sealant.

All used disinfecting solutions, gloves and other disposable items should be stored in a sharps or other waste container and disposed or sterilised appropriately at the completion of fieldwork. Disinfecting solutions must not come into contact with frogs or be permitted to contaminate any water bodies

2.4 Disinfection Methods

Disinfecting agents for hands and equipment must be effective against bacteria and both the vegetative and spore stages of fungi. The following agents are recommended:

- Chloramine and Chlorhexidine based products such as *Halamid*©, *Halasept*© or *Hexifoam*© are effective against both bacteria and fungi. These products are suitable for use on hands, footwear, instruments and other equipment. The manufacturers instructions should be followed when preparing these solutions.
- Bleach and alcohol (ethanol or methanol), diluted to appropriate concentrations can be effective against bacteria and fungi. However, these substances may be less practical because of their corrosive and hazardous nature.

  When using methanol either:

  - immerse in 70% methanol for 30 minutes or
  - dip in 100% methanol then flame for 10 seconds or boil in water for 10 minutes

Fresh bleach (5% concentration) may be also effective against other frog pathogens such as Rana Virus.

Some equipment not easily disinfected in these ways can be effectively cleaned using medical standard 70% isopropyl alcohol wipes – *Isowipes*©.

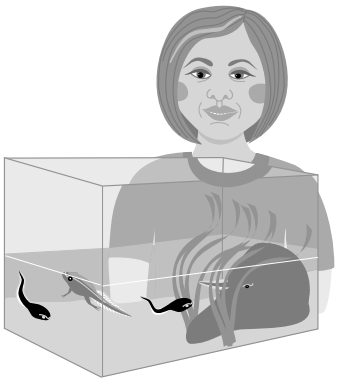
3 captive frog hygiene management

3.1 Housing frogs and tadpoles

Frogs and tadpoles should only be removed from a site when absolutely necessary.

When it is necessary for frogs or tadpoles to be collected and held for a period of time, the following measures should be undertaken:

- Animals obtained at different sites should be kept isolated from each other and from other captive animals.
- Aquaria set up to hold frogs should not share water, equipment or any filtration system. Splashes of water from adjacent enclosures or drops of water on nets may transfer pathogens between enclosures.
- Prior to housing frogs or tadpoles, ensure that tanks, aquaria and any associated equipment are disinfected.
- Tanks and equipment should be cleaned, disinfected and dried immediately after frogs/tadpoles are removed.



Careful maintenance of your enclosures will ensure a safe and hygienic environment for captive frogs and tadpoles.

When contemplating a release of captive bred tadpoles for conservation purposes a Translocation Proposal should be submitted to the DECC and pathological screening for disease should be undertaken (see also DECC Translocation Policy). Tadpoles can be tested by randomly removing 10 individuals at 6 weeks and again at 2 weeks before anticipated release. Testing could be undertaken by the pathology section at Taronga Zoo, Newcastle University, CSIRO Australian Animal Health Laboratories at Geelong and James Cook University at Townsville. Such an arrangement would need to be negotiated by contacting one of these institutions well before the anticipated release date. (see Appendix 2 for contact details)

DECC have licenced NSW Schools to allow students and/or teachers to remove tadpoles for classroom life cycle studies. They are authorised to remove individuals from only one location, each school also requires endorsement from Department of Education and Training Animal Care and Ethics Committee and comply with this protocol.

Tadpoles collected for these purposes are to be obtained from the local area of the school and are not to be obtained from DECC Reserves. As soon as tadpoles have transformed, froglets must be returned to the exact point of capture. Tadpoles from different locations are not to be mixed.

Antifungal cleansing treatments to clear tadpoles of the frog chytrid fungus are currently being trialed. In the future, such a treatment may be an added procedure required prior to froglet releases.

Detailed information on safely maintaining frogs in captivity is provided in Voigt (2001).

3.2 Tadpole treatment

In most instances:

Release to the wild of tadpoles held or bred in captivity should be avoided.

3.3 Frog treatment

The rigour with which frogs must be treated to ensure pathogens are not introduced to native populations means that any proposal for the removal of adult frogs (particularly threatened species) from wild populations should be given careful consideration.

When it is essential for frogs to be removed from the wild, the following should apply.

Individuals to be released should be quarantined for a period of 2 months and monitored for any signs of illness or disease.

Frogs must not be released if any evidence of illness or infection is detected. If illness is suspected, further advice must be sought from a designated frog recipient (Appendix 2) as soon as possible to determine the nature of the problem. Chytridiomycosis can be diagnosed in live frogs by microscopical examination of preserved toe clips or from shedding skin samples. Research is still in progress on the development of a simple technique for the detection of Chytridiomycosis and a treatment for infected frogs.

Current methods which may be used include:

- A technique for the treatment of potentially infected frogs is to place the frogs individually in a 1mg/L benzalkonium chloride solution for 1 hour on days 1, 3, 5, 9, 11 and 13 of the treatment period. Frogs are then isolated/quarantined for two months. This and other possible treatments are documented in Berger and Speare (1998)
- *Betadine*© and *Bactone*© treatments have also been used on adult frogs with some success (M. Mahony, Newcastle University pers. comm.)
- *Itraconazole*© is an expensive drug which has been used successfully (Lee Berger CSIRO Australian Animal Health Laboratory pers. comm.). Information on this method is available on the Website http://www.jcu.edu.au/school/PHTM/frogs/adms/attach6.pdf.

Frogs undergoing treatment should be housed individually and kept separate from non-infected individuals.

3.4 Displaced frogs

Displaced frogs are those native frog species and introduced Cane Toads (Bufo marinus) which have been unintentionally transported around the country with fresh produce, transported produce and landscaping supplies. Procedures to be undertaken when encountering introduced/displaced native frog species (as well as Cane Toads) are as follows.

3.4.1 Banana box frogs

'Banana Box' frog is the term used to describe several native frog species (usually Litoria gracilenta, L. infrafrenata, L. bicolor and L. caerulea) commonly transported in fruit and vegetable shipments and landscaping supplies. In the past, well meaning individuals have attempted to return these frogs to their place of origin but this is usually impossible to do accurately. There is risk of spread of disease if these frogs are transferred from place to place.

It is strongly recommended that:

Displaced Banana Box frogs should be treated as if they are infected and should not to be freighted anywhere for release to the wild unless specifically approved by DECC.

When encountering a displaced frog:

- Contact a licensed wildlife carer organisation to collect the animal. The frog should then undergo a quarantine period of 2 months along with an approved disinfection treatment.
- Post-quarantine, the frog (if one of the species identified above) may be transferred to a licensed frog keeper. All other species require the permission from DECC Wildlife Licensing and Management Unit (WLMU) prior to transfer. Licensed carer groups are to record and receipt frogs obtained and disposed of in this way.
- Licensed Frog Keepers are to list these frogs in their annual licence returns to DECC.

Frogs held by licensed frog keepers are not to be released to the wild except with specific DECC approval.

Displaced frogs may be made available to recognised institutions for research projects, display purposes or perhaps offered to the Australian Museum as scientific specimens once approval has been provided by the DECC WLMU.

Frogs are often unintentionally transported with fresh produce and landscaping supplies. They are collectively known as 'banana box' or displaced frogs.

3.4.2 Cane toads

Cane toads are known carriers of the Frog chytrid fungus and should not be knowingly transported or released to the wild.

If a cane toad is discovered outside of its normal range, it should be humanely euthanased in accordance with the recommended NSW Animal Welfare Advisory Council procedure (see Appendix 3). Care should be taken to avoid euthanasia of native species due to mistaken identity.

3.4.3 Local frog species

Frogs encountered on roads, around dwellings and gardens or in swimming pools should not be considered as displaced frogs.

Frogs encountered in these situations should be assisted off roads, away from dwellings, or out of swimming pools preferably to the nearest area of vegetation or suitable habitat.

Incidences of frogs spawning or tadpoles appearing in swimming pools should be referred to a wildlife carer/rescue organisation for assistance (see Appendix 4).

Contact the Frogwatch Helpline if you are unsure whether a frog is a local species or displaced.

An NPWS information brochure titled 'Cane Toads in NSW' provides further information on cane toads and assistance with identification of some of the commonly misidentified native species. This information is also available on the DECC website.

4 sick or dead frogs

Unless an obvious cause of illness or death is evident (eg predation or road mortality): Sick or dead frogs encountered in the wild should be collected and disposed of in accordance with the procedures described in section 4.2 below.

4.1 Symptoms of sick and dying frogs

Sick and dying frogs exhibit a range of symptoms characteristic of chytrid infection. Symptoms may be expressed in the external appearance or behaviour of the animal. A summary of these symptoms are described below. More detailed information can be found in Berger et al., (1999) or at the James Cook University Amphibian Disease website at: http://www/jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm.

Appearance (one or more symptoms)

- darker or blotchy upper (dorsal) surface
- reddish/pink-tinged lower (ventral) surface and/or legs and/or webbing or toes
- swollen hind limbs
- very thin or emaciated
- skin lesions (sores, lumps)
- infected eyes
- obvious asymmetric appearance

Behaviour (one or more symptoms)

- lethargic limb movements, especially hind limbs
- abnormal behaviour (eg a nocturnal, burrowing or arboreal frog sitting in the open during the day and making no vigorous attempt to escape when approached)
- little or no movement when touched

Great barred frog (*Mixophyes fasciolatus*) with severe Chytrid infection — note lethargic attitude and sloughing skin. Photo: L. Berger

Diagnostic behaviour tests

Sick frogs will fail one or more of the following tests:

test	healthy	sick
Gently touch with finger	Frog will blink	Frog will not blink above the eye
Turn frog on its back	Frog will flip back over	Frog will remain on its back
Hold frog gently by its mouth	Frog will use its forelimbs to try to remove grip	No response from frog

4.2 What to do with sick or dead frogs

A procedure for the preparation and transport of a sick or dead frog is given below[2]. Adherence to this procedure will ensure the animal is maintained in a suitable condition for pathological examination and assist the DECC and researchers to determine the extent of the disease and the number of species affected.

- Disposable gloves should be worn when handling sick or dead frogs. Avoid handling food and touching your mouth or eyes as this could transfer pathogens and toxic skin secretions from some frog species.
- New gloves and a clean plastic bag should be used for each frog specimen to prevent cross-contamination. When gloves are unavailable, use an implement to transfer the frog to a container rather than using bare hands.
- If the frog is dead, keep the specimen cool and preserve as soon as possible (as frogs decompose quickly after death making examination difficult). Specimens can be fixed/preserved in 70% ethanol or 10% buffered formalin.

Cut open the belly and place the frog in about 10 times its own volume of preservative. Alternatively, specimens can be frozen (although this makes tissues unsuitable for some tests). If numerous frogs are collected, some should be preserved and some should be frozen. Portions of a dead frog can be sent for analysis eg a preserved foot, leg or a portion of abdominal skin.

- The container should be labelled showing at least the species, date and location. A standardised collection form is provided in Appendix 5.
- If the frog is alive but unlikely to survive transportation (death appears imminent), euthanase the frog (see Appendix 3) and place the specimen in a freezer. Once frozen, the specimen is ready for shipment to the address provided below.
- If the frog is alive and likely to survive transportation, place the frog into either a moistened cloth bag with some damp leaf litter or into a plastic bag with damp leaf litter and partially inflated before sealing. Remember to keep all frogs separated during transportation.
- Preserved samples can be sent in jars or wrapped in wet cloth, sealed in bags and placed inside a padded box.
- Send frozen samples in an esky with dry ice (available from BOC/CIG Gas outlets).
- Place live or frozen specimens into a small styrafoam esky (available from K-Mart/Big W for approximately $2.50).
- Seal esky with packaging tape and address to one of the laboratories listed in Appendix 4.
- Send the package by courier.

Further information on sick and dying frogs is available on the Amphibian Disease Home Page at http://www.jcu.edu.au/dept/PHTM/frogs/ampidis.htm — in particular refer to *'What to do with dead or ill frogs'*.

[2] The measures described below are standard procedures and may vary slightly depending on the distance and time required to reach the intended recipient. Contact the intended recipient of the sick or dead frog prior to sending to confirm the appropriate procedure.

5 references

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appendix 1

hygiene protocol checklist and field kit

The following checklist and field kit are designed to assist with minimising the risk of transferring pathogens between frogs.

Have you considered the following questions before handling frogs in the field:

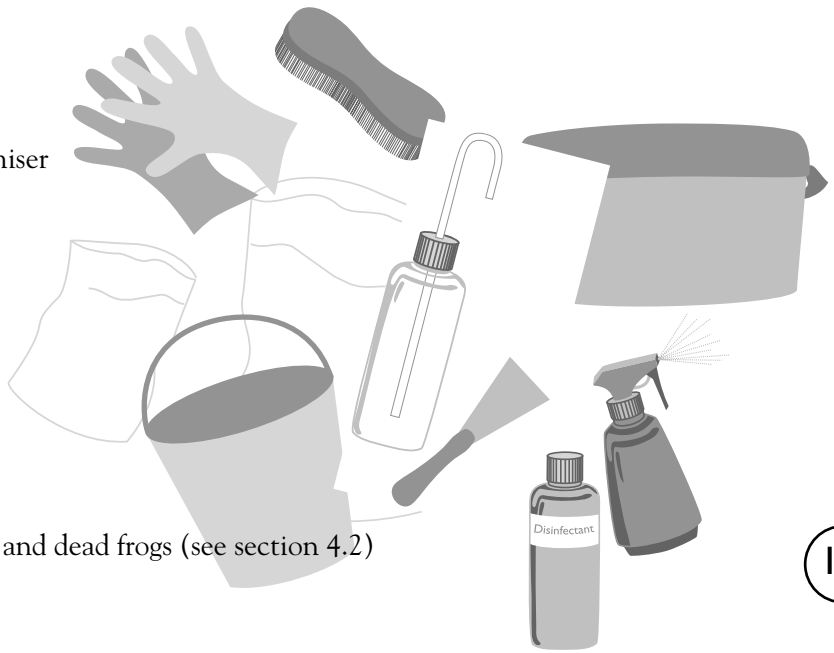
- Has your proposed field trip been sufficiently well planned to consider hygiene issues?
- Have you taken into account boundaries between sites (particularly where endangered species or populations at risk are known to occur)?
- Have footwear disinfection procedures been considered and a strategy adopted?
- Have you planned the equipment you will be using and developed a disinfection strategy?
- Are you are planning to visit sites where vehicle disinfection will be needed (consider both vehicle wheels/tyres and control pedals) and if so, do you have a plan to deal with vehicle disinfection?
- Have handling procedures been planned to minimise the risk of frog to frog pathogen transmission?
- Do you have a planned disinfection procedure to deal with equipment, apparel and direct contact with frogs?

If you answered NO to any of these questions please re-read the relevant section of the DECC Hygiene Protocol for the Control of Disease in Frogs and apply a suitable strategy.

Field hygiene kit

When planning to survey frogs in the field a portable field hygiene kit should be assembled to assist with implementing this protocol. Recommended contents of a field hygiene kit would include:

- Small styrofoam eski
- Disposable gloves
- Disinfectant spray bottle (atomiser spray) and/or wash bottle
- Disinfecting solutions
- Wash bottle
- Scraper or scrubbing brush
- Small bucket
- Plastic bags large and small
- Container for waste disposal
- Materials for dealing with sick and dead frogs (see section 4.2)



appendix 2

designated sick and dead frog recipients

Always contact the relevant specialist prior to sending a sick or dead frog. In some cases, only wild frogs will be assessed for disease. Analysis may also attract a small fee per sample.

Contact one of the following specialists to arrange receipt and analyse sick and dead frogs. Make contact prior to dispatching package:

Karrie Rose
Australian Registry if Wildlife Health
Taronga Conservation Society, Australia
PO Box 20
MOSMAN NSW 2088

Phone: 02 9978 4749
Fax: 02 9978 4516
Krose@zoo.nsw.gov.au

Diana Mendez or
Rick Speare
School of Public Health,
Tropical Medicine and
Rehabilitation Sciences
James Cook University
Douglas Campus
TOWNSVILLE QLD 4811

Phone: 07 4796 1735
Fax: 07 4796 1767
Diana.Mendez@jcu.edu.au
Richard.Speare@jcu.edu.au

Michael Mahony
School of Biological Sciences
University of Newcastle
CALLAGHAN NSW 2308

Phone: 02 4921 6014
Fax: 02 4921 6923
bimjm@cc.newcastle.edu.au

For information on frog keeping licences and approvals to move some species of displaced frog contact:

Co-ordinator, Wildlife Licensing
Wildlife Licensing and Management Unit
DECC
PO Box 1967
Hurstville NSW 1481
Ph 02 9585 6481
Fax 02 9585 6401
wildlife.licensing@environment.nsw.gov.au

For information on the possible identity of displaced frogs contact:

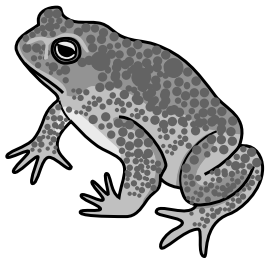
Frog and Tadpole Society (FATS)
Frogwatch Helpline

Ph: 0419 249 728

appendix 3

NSW Animal Welfare Advisory Council methodology

The NSW Animal Welfare Advisory Council procedure for humanely euthanasing cane toads or terminally ill frogs is stated as follows:



- Using gloves, or some other implement, place cane toad or terminally ill frog into a plastic bag.
- Cool in the refrigerator to 4°C.
- Crush cranium with a swift blow using a blunt instrument.

Note: Before killing any frog presumed to be a cane toad, ensure that it has been correctly identified and if outside the normal range for cane toads in NSW (north coast) that local DECC regional office is informed.

appendix 4

licensed wildlife carer and rescue organisations

Following is a list of wildlife rehabilitation groups licensed by Department of Environment and Climate Change (NSW):

Northern NSW

Australian Seabird Rescue
For Australian Wildlife Needing Aid (FAWNA)
Friends of the Koala
Friends of Waterways (Gunnedah)
Great Lakes Wildlife Rescue
Koala Preservation Society of NSW
Northern Rivers Wildlife Carers
Northern Tablelands Wildlife Carers
Tweed Valley Wildlife Carers
Seaworld Australia
WIRES branches in Northern NSW

Southern NSW

Looking After Our Kosciuszko Orphans (LAOKO)
Native Animal Network Association
Native Animal Rescue Group
Wildcare Queanbeyan
WIRES branches in Southern NSW

Sydney, Hunter and Illawarra

Hunter Koala Preservation Society
Ku-ring-gai Bat Colony Committee
Kangaroo Protection Co-operative
Native Animal Trust Fund
Organisation for the Rescue and Research of Cetaceans (ORRCA)
Sydney Metropolitan Wildlife Services
Wildlife Aid
Wildlife Animal Rescue and Care (Wildlife ARC)
Waterfall Springs Wildlife Park
Oceanworld
Wildlife Care Centre, John Moroney Correctional Centre
Koalas in Care
WIRES branches around Sydney, Hunter and Illawarra

Western NSW

Rescue and Rehabilitation of Australian Native Animals (RRANA)
RSPCA Australian Capital Territory Inc.
Wildlife Carers Network (Central West)
WIRES branches in Western NSW
Cudgegong Wildlife Carers

[4] Note: some of these organisations may not care for frogs.

appendix 5 — sick or dead frog collection form

Sender details:

name: address: postcode:

phone: (w) (h) fax: email:

Collector details: (where different to sender)

name: address: postcode:

phone: (w) (h) fax: email:

Specimen details:

record no: no. of specimens: species name: date collected:
day/month/year

time collected: sex: status at time of collection: date sent:
male/female healthy(H)/ sick(S)/ dead(D) day/month/year

location: map grid reference:
(easting) (northing)

reason for collection:

Batch details for multiple species collection:

species	no.	locality	(AMG)	date	sex	status (H/S/D)

habitat type: vegetation type: micro habitat:
eg creek, swamp, forest eg rainforest, sedgeland eg creek bank, under log, amongst emergent vegetation, on ground in the open

unusual behaviour of sick frogs:
eg lethargic, convulsions, sitting in the open during the day, showing little or no movement when touched.

dead frogs appearance:
eg thin, reddening of skin on belly and/or toes, red spots, sore, lumps or discolouration on skin

deformed frogs: dead/sick tadpoles:
eg limb(s) missing, abnormal shape or length eg numbers/behaviour

unusual appearance of egg masses: recent use of agricultural chemicals in area:
eg grey or white eggs eg pesticides, herbicides, fertilisers

other potential causes of sickness/mortality/comments/additional information:

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

General inquiries: PO Box A290 South Sydney 1232
Phone: 9995 5000 or 1300 361967
Fax: 02 9995 5999 **Web site:** www.environment.nsw.gov.au

Department of **Environment & Climate Change** NSW

Appendix C

Priority weed species

Table C.1 Weeds listed within Project area

Common name	Scientific name	Status
Khaki Weed	*Alternanthera pungens*	
Bitou Bus	*Chrysanthemoides monilifera subsp. Rotundata*	State priority weed
Fountain grass	*Cenchrus setaceus*	
Moth vine	*Araujia sericifera*	Regional significance
Oleander	*Nerium oleander*	
Crofton weed	*Ageratina Adenophora*	Regional significance
Mistflower	*Ageratina riparia*	
Groundsel bush	*Baccharis halimifolia*	Regional priority weed
Spear thistle (also known as black thistle)	*Cirsium vulgare*	
Japanese honeysuckle	*Lonicera japonica*	
Morning glory - coastal (also known as mile-a-minute*)*	*Ipomoea cairica.*	Regional significance
Cockspur coral tree	*Erythrina crista-galli*	
African olive	*Olea europaea subsp. cuspidate*	
Tussock paspalum	*Paspalum quadrifarium*	
Fountain grass	*Cenchrus setaceus*	
Giant Parramatta grass	*Sporobolus fertilis*	Regional priority weed
Coolatai grass	*Hyparrhenia hirta*	Regional priority weed
Broad-leaf pepper tree (also known as Brazilian pepper tree)	*Schinus terebinthifolius.*	
Trad (also known as Wandering Jew) *(*	*Tradescantia fluminensis*	
Castor oil plant *(Ricinus communis).*	*Ricinus communis*	
Chinese tallow tree (also known as Chinese Tallow, Chinese tallowood)	*Triadica sebifera*	
Honey locust *(Gleditsia triacanthos).*	*Gleditsia triacanthos*	Regional significance
Cassia (also known as senna, Easter cassia*)*	*Senna pendula var. glabrata*	
Camphor laurel	*Cinnamomum camphora*	
Cotoneaster (also known as large-leaf cotoneaster)	*Cotoneaster glaucophyllus*	
Ochna (also known as Mickey mouse plant)	*Ochna serrulate*	
Turkey rhubarb *(*also known as rambling dock)	*Rumex sagittatus*	Regional significance
Green cestrum *(*also known as green poison berry, Chilean cestrum)	*Cestrum parqui*	Regional significance
Madeira vine (also known as lamb's tails)	*Anredera cordifolia*	WoNS
Blackberry	*Rubus fruticosus species aggregate*	WoNS
Lantana	*Lantana camara*	WoNS

Common name	Scientific name	Status
Bridal creeper (also known as common bridal creeper)	*Asparagus asparagoides*	WoNS
Ground asparagus (also known as asparagus fern, basket fern, Sprengeri's fern, bush asparagus, emerald asparagus, Sprengeri cultivar, Variegata cultivar*)*	*Asparagus aethiopicus*	WoNS
Fireweed	*Senecio madagascariensis*	WoNS

Appendix 1: Priority weeds for South East Local Land Services Region

This appendix covers State level determined priority weed species (A1.1) as set by NSW DPI and regionally determined priorities (A1.2) as determined by the rigorous weed prioritisation and expert review process outlined in Section 4.3.

Appendix 1.1 details the specific legal requirements for state level priority weeds and high risk activities. For each state level priority weed, the management objective, and specific requirements for its management (as stated in the *Biosecurity Act 2015* and regulations) is included. These specific requirements include Prohibited Matter, Biosecurity Zones, Control Orders and Mandatory Measures.

Appendix 1.2 identifies regionally prioritised weeds and outcomes to demonstrate compliance with the General Biosecurity Duty. Recommended measures to achieve these outcomes are provided in the NSW DPI web and mobile based application, WeedWise.

A1.1 State priority weeds

State Priority Weed Objective – PREVENTION (Whole of State): *The following weeds are currently not found in some parts of the state, pose significant biosecurity risk and prevention of the biosecurity risk posed by these weeds is a reasonably practical objective.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
Gamba grass *Andropogon gayanus*	Prohibited Matter (Part 4, Division 1, Clause 28, Biosecurity Act 2015): A person who deals with any biosecurity matter that is Prohibited Matter throughout the State is guilty of an offence. Regional Strategic Response: Trigger rapid response protocol
Pond apple *Annona glabra*	
Bridal veil creeper *Asparagus declinatus*	
Kochia *Bassia scoparia (excluding subsp. trichophylla*)	
Spotted knapweed *Centaurea stoebe* subsp. *micranthos*	
Black knapweed *Centaurea x moncktonii*	
Siam weed *Chromolaena odorata*	
Koster's curse *Clidemia hirta*	
Rubber vine *Cryptostegia grandiflora*	
Anchored water hyacinth *Eichhornia azurea*	
Hawkweed *Hieracium* spp (all species)	
Hydrocotyl/Water pennywort *Hydrocotyle ranunculoides*	
Lagarosiphon *Lagarosiphon major*	
Frogbit/Spongeplant *Limnobium* spp. (all species)	
Yellow burrhead *Limnocharis flava*	
Miconia *Miconia* spp. (all species)	
Mikania vine *Mikania micrantha*	
Mimosa *Mimosa pigra*	
Eurasian water milfoil *Myriophyllum spicatum*	
Mexican feather grass *Nassella tenuissima* (syn. *Stipa tenuissima*)	
Broomrape *Orobanche* spp. (all species except the native *O. cernua* var. *australiana* and *O. minor*)	
Water soldier *Stratiotes aloides*	
Witchweed *Striga* spp. (except the native *S. parviflora*)	
Water caltrop *Trapa* spp. (all species)	
Karoo acacia *Vachellia karroo* (syn. *Acacia karroo*)	
Prickly acacia *Vachellia nilotica* (syn. *Acacia nilotica*)	

State Priority Weed Objective – PREVENTION (Whole of State): *The following weeds are currently not found in some parts of the state, pose significant biosecurity risk and prevention of the biosecurity risk posed by these weeds is a reasonably practical objective.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
All species of vascular plant (Tracheophyta)	***Mandatory Measure (Part 2, Division 8, Clause 34, draft Biosecurity Regulation 2016)*** *Duty to notify on importation of plants into the State:* (1) A person must not import into the state a species of vascular plant (Tracheophyta) if the species is not currently present in the State unless the person has, at least 20 working days before the plant is imported into the State, notified the species of plant and its proposed location within the State. (2) The notification is to be given to the secretary and is to be given in accordance with Part 6. (3) A species of plant is taken not to be present in the State if the National Herbarium of New South Wales does not show it as being present in the State. See http://plantnet.rbgsyd.nsw.gov.au/. **Regional Strategic Response:** Trigger rapid response protocol
Parthenium weed *Parthenium hysterophorus*	***Prohibited Matter (Part 4, Biosecurity Act 2015):*** A person who deals with any biosecurity matter that is Prohibited Matter throughout the State is guilty of an offence. ***Mandatory Measure (Part 2, Division 8, Clause 35, draft Biosecurity Regulation 2016) - Parthenium weed carriers, machinery and equipment*** (1) This clause applies to the following equipment: (a) grain harvesters (including the comb or front) (b) comb trailers (including the comb or front) (c) bins used for holding grain during harvest operations (d) augers or similar equipment used for moving grain (e) vehicles used for transporting grain harvesters (f) vehicles used as support vehicles with grain harvesters and that have been driven in paddocks during harvest operations (g) mineral exploration drilling rigs and vehicles used for transporting those rigs (2) A person must not import into the State from Queensland any equipment to which this clause applies. **Regional Strategic Response:** Trigger rapid response protocol

State Priority Weed Objective – ERADICATION (Whole of State): *The following weeds are present in limited distribution and abundance in some parts of the state. Elimination of the biosecurity risk posed by these weeds is a reasonably practical objective.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
Tropical soda apple *Solanum viarum*	***Biosecurity (Tropical Soda Apple) Control Order 2017.*** **6. Control measures for owners and occupiers of land** Pursuant to section 62(1)(b) of the Act, an owner or occupier of land in the Tropical Soda Apple Control Zone on which there is Tropical Soda Apple must: (a) notify the local control authority for the area if the Tropical Soda Apple is part of a new infestation of Tropical Soda Apple on the land: i) as soon as practicable after becoming aware of the new infestation; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2)the location of the Tropical Soda Apple, including the property identification code for the land (if this is known); and (3)any other information reasonably requested by the local control authority; and (b) destroy all Tropical Soda Apple on the land, including fruit; and (c) ensure that subsequent generations of Tropical Soda Apple are destroyed; and (d) that the land is kept free of Tropical Soda Apple. (e) The owner or occupier does not need to comply with (a) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. **7. Control measures for persons dealing with carriers** Pursuant to section 62(1)(b) of the Act, a person who deals with a carrier of Tropical Soda Apple in the Tropical Soda Apple Control Zone, in circumstances where the person knows or ought reasonably to know of the presence of Tropical Soda Apple on the land or in or on the carrier, must: (a) ensure that Tropical Soda Apple (including any seed and propagules) is not moved from the land; and (b) immediately notify the local control authority for the area: i) as soon as practicable after becoming aware of the presence of Tropical Soda Apple; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2) the location of the Tropical Soda Apple, including the property identification code for the land (if this is known); and iv) any other information reasonably requested by the local control authority. (c) The person who deals with a carrier of Tropical Soda Apple does not need to comply with (b) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. **Regional Strategic Response:** Trigger rapid response protocol

State Priority Weed Objective – ERADICATION (Whole of State): *The following weeds are present in limited distribution and abundance in some parts of the state. Elimination of the biosecurity risk posed by these weeds is a reasonably practical objective.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
Boneseed *Chrysanthemoides monilifera* subspecies *monilifera*	***Biosecurity (Boneseed) Control Order 2017.*** **1. Control measures for owners and occupiers of land** Pursuant to section 62(1)(b) of the Act, an owner or occupier of land in the Boneseed Control Zone on which there is Boneseed must: (a) notify the local control authority for the area if the Boneseed is part of a new infestation on the land: i) as soon as practicable after becoming aware of the new infestation; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2) the location of the Boneseed, including the property identification code for the land (if this is known); and (3) any other information reasonably requested by the local control authority; and (b) immediately destroy all Boneseed on the land; (c) ensure that subsequent generations of Boneseed are destroyed; and (d) the land is kept free of Boneseed. (e) The owner or occupier does not need to comply with (a) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. **2. Control measures for persons dealing with carriers** Pursuant to section 62(1)(b) of the Act, a person who deals with a carrier of Boneseed in the Boneseed Control Zone, in circumstances where the person knows or ought reasonably to know of the presence of Boneseed on the land or in or on the carrier, must: (a) ensure that Boneseed (including any seed and propagules) is not moved from the land; and (b) immediately notify the local control authority for the area: i) as soon as practicable after becoming aware of the presence of Boneseed; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2) the location of the Boneseed, including the property identification code for the land (if this is known); and iv) any other information reasonably requested by the local control authority. (c) The person who deals with a carrier of Boneseed does not need to comply with (b) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. ***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2016):*** A person must not import into the State or sell. **Regional Strategic Response:** Trigger rapid response protocol

State Priority Weed Objective – ERADICATION (Whole of State): *The following weeds are present in limited distribution and abundance in some parts of the state. Elimination of the biosecurity risk posed by these weeds is a reasonably practical objective.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
Parkinsonia *Parkinsonia aculeata*	***Biosecurity (Parkinsonia) Control Order 2017.*** **3. Control measures for owners and occupiers of land** Pursuant to section 62(1)(b) of the Act, an owner or occupier of land in the Parkinsonia Control Zone on which there is Parkinsonia must: (f) notify the local control authority for the area if the Parkinsonia is part of a new infestation of Parkinsonia on the land: i) as soon as practicable after becoming aware of the new infestation; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2) the location of the Parkinsonia, including the property identification code for the land (if this is known); and (3) any other information reasonably requested by the local control authority; and (g) immediately destroy all Parkinsonia on the land; and (h) ensure that subsequent generations of Parkinsonia are destroyed; and (i) the land is kept free of Parkinsonia. (j) The owner or occupier does not need to comply with (a) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. **4. Control measures for persons dealing with carriers** Pursuant to section 62(1)(b) of the Act, a person who deals with a carrier of Parkinsonia in the Parkinsonia Control Zone, in circumstances where the person knows or ought reasonably to know of the presence of Parkinsonia on the land or in or on the carrier, must: (d) ensure that Parkinsonia (including any seed and propagules) is not moved from the land; and (e) immediately notify the local control authority: i) as soon as practicable after becoming aware of the presence of Parkinsonia; ii) verbally or in writing; iii) giving the following: (1) the person's full name and contact number; (2) the location of the Parkinsonia, including the property identification code for the land (if this is known); and iv) any other information reasonably requested by the local control authority. (f) The person who deals with a carrier of Parkinsonia does not need to comply with (b) above if they know that notification of the infestation on the land has already been given to the local control authority for the area. ***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2016):*** A person must not import into the State or sell. **Regional Strategic Response:** Trigger rapid response protocol

State Priority Weed Objective – CONTAINMENT: *These weeds are widely distributed in some parts of the state. While broad scale elimination is not practicable, minimisation of the biosecurity risk posed these weeds is reasonably practicable.*		
Species	**Land area where requirements apply**	**Biosecurity Act requirements & Strategic Response in the region**
Alligator weed *Alternanthera philoxeroides*	A Biosecurity Zone, to be known as the **alligator weed biosecurity zone**, is established for all land within the state except land in the following regions: (a) Greater Sydney, (b) Hunter (but only in respect of land in the local government area of City of Lake Macquarie, City of Maitland, City of Newcastle or Port Stephens).	**Biosecurity Regulation 2017 - Part 5, Division 2 (Alligator weed biosecurity zone)** An owner or occupier of land in the alligator weed biosecurity zone on which there is the weed *Alternanthera philoxeroides* (Alligator weed) must: (a) if the weed is part of a new infestation of the weed on the land, notify the local control authority for the land as soon as practicable in accordance with Part 6, and (b) eradicate the weed or, if that is not practicable, destroy as much of the weed as is practicable and suppress the spread of any remaining weed. ***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017):*** A person must not import into the State or sell. **Regional Strategic Response:** Trigger rapid response protocol
Bitou bush *Chrysanthemoides monilifera* subsp. *rotundata*	A Biosecurity Zone, to be known as the **bitou bush biosecurity zone**, is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the South.	**Biosecurity Regulation 2017 - Part 5, Division 3 (Bitou bush biosecurity zone)** An owner or occupier of land in the bitou bush biosecurity zone on which there is the weed *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou bush) must: (a) if the weed is part of a new infestation of the weed on the land, notify the local control authority for the land as soon as practicable in accordance with Part 6, and (b) eradicate the weed or if that is not practicable destroy as much of the weed as is practicable and suppress the spread of any remaining weed. ***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017):*** A person must not import into the State or sell. **Regional Strategic Response within the Biosecurity Zone:** Trigger rapid response protocol **Regional Strategic Response outside the Biosecurity Zone:** Species managed in accordance with published weed management plans

State Priority Weed Objective – CONTAINMENT: *These weeds are widely distributed in some parts of the state. While broad scale elimination is not practicable, minimisation of the biosecurity risk posed these weeds is reasonably practicable.*		
Species	**Land area where requirements apply**	**Biosecurity Act requirements & Strategic Response in the region**
Water hyacinth *Eichhornia crassipes*	A Biosecurity Zone, to be known as the Water Hyacinth Biosecurity Zone, is established for all land within the State except land in the following regions: (a) Greater Sydney or North Coast, (b) North West (but only land in those regions that is in the local government area of Moree Plains), (c) Hunter (but only land in that region that is in the local government area of City of Cessnock, City of Lake Macquarie, Mid-CoastCity of Maitland or Port Stephens), (d) South East (but only land in that region that is in the local government area of Eurobodalla, Kiama, City of Shellharbour, City of Shoalhaven or City of Wollongong).	***Biosecurity Regulation 2017 - Part 5, Division 4 (Water hyacinth biosecurity zone)*** An owner or occupier of land in the water hyacinth biosecurity zone on which thereis the weed *Eichhornia crassipes* (Water Hyacinth) must: (a) if the weed is part of a new infestation of the weed on the land, notify the local control authority for the land as soon as practicable in accordance with Part 6, and (b) eradicate the weed or if that is not practicable destroy as much of the weed as is practicable and suppress the spread of any remaining weed. ***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017):*** A person must not import into the State or sell. **Regional Strategic Response within the Biosecurity Zone:** Trigger rapid response protocol **Regional Strategic Response outside the Biosecurity Zone:** Species managed in accordance with published weed management plans

State Priority Weed Objective – ASSET PROTECTION (Whole of State): *These weeds are widely distributed in some areas of the State. As Weeds of National Significance, their spread should be minimised to protect priority assets.*	
Species	**Biosecurity Act requirements & Strategic Response in the region**
Madeira vine *Anredera cordifolia*	***Mandatory Measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017):*** A person must not import into the State or sell. **Regional Strategic Response:** Species managed in accordance with published weed management plans. # These species have additional outcomes and regional strategic responses in Appendix 1.2
Asparagus weeds *Asparagus aethiopicus*#, *A. africanus*#, *A. asparagoides*# including the Western Cape form, *A. plumosus*#, *A. scandens*#	
Cabomba *Cabomba caroliniana*#	
Scotch/English broom *Cytisus scoparius* subsp. *scoparius*#	
Cat's claw creeper *Dolichandra unguis-cati*#	
Cape/Montpellier broom *Genista monspessulana*#	
Olive Hymenachne *Hymenachne amplexicaulis*	
Bellyache bush *Jatropha gossypiifolia*	
Lantana *Lantana camara*#	
African boxthorn *Lycium ferocissimum*	
Chilean needlegrass *Nassella neesiana*	
Serrated tussock *Nassella trichotoma*#	
Opuntioid cacti: *Opuntia* spp., *Cylindropuntia* spp., *Austrocylindropuntia* spp. (Excludes *O. ficus- indica*)	
Mesquite *Prosopis* spp.	
Blackberry *Rubus fruticosus* agg. (Blackberry except the varietals Chester Thornless, Dirksen Thornless, Loch Ness, Silvan, Black Satin, Murrindindi, Smooth Stem, Thornfree and Chehalem)	
Sagittaria *Sagittaria platyphylla*	
Willows *Salix* spp.(excludes *S.babylonica*, *S.x calodendron* & *S. x reichardtii*)	
Salvinia *Salvinia molesta*#	
Fireweed *Senecio madagascariensis*#	
Silver-leaf nightshade *Solanum elaeagnifolium*	
Athel pine *Tamarix aphylla*	
Gorse *Ulex europaeus*#	

A1.2 Regional priority weeds

Regional Priority Weed Objective – PREVENTION (Whole of Region):

The following weeds are currently not found in the region, pose significant biosecurity risk and prevention of the biosecurity risk posed by these weeds is a reasonably practical objective.

Species	Outcomes to demonstrate compliance with the GBD	Strategic Response in the region
Sicklethorn *Asparagus falcatus* Kidney leaf mud plantain *Heteranthera reniformis* Glush weed *Hygrophila costata* Water lettuce *Pistia stratiotes* Holly leaved senecio *Senecio glastifolius* Giant rat's tail grass *Sporobolus pyramidalis*	• The plant is eradicated from the land and the land is kept free of the plant • Land managers mitigate the risk of new weeds being introduced to their land • The Local Control Authority is aware the plant is found on the land • The plant or parts of the plant are not traded, carried, grown or released into the environment	• Implement quarantine and/or hygiene protocols • Undertake high risk sites & pathways analysis to identify potential introduction areas and preventative options • Have a collaborative rapid response protocol in place

<table>
<tr><th colspan="3">Regional Priority Weed Objective – ERADICATION (Whole of Region):
The following weeds are present in limited distribution and abundance in the region. Elimination of the biosecurity risk posed by these weeds is a reasonably practical objective.</th></tr>
<tr><th>Species</th><th>Outcomes to demonstrate compliance with the GBD</th><th>Strategic Response in the region</th></tr>
<tr><td>Ming asparagus Asparagus macowanii var. zuluensis</td><td rowspan="15">• The plant is eradicated from the land, or if that is not practicable then as much of the plant as is practicable is destroyed and the spread of any remaining plant is suppressed
• Land managers mitigate the risk of new weeds being introduced to their land
• The plant or parts of the plant are not traded, carried, grown or released into the environment
• Local Control Authority is notified if the plant is found on the land

* For these species, the following legislative requirement also applies: Mandatory measure (Part 2, Division 8, Clause 29, draft Biosecurity Regulation 2016): A person must not move, import into the State or sell any plant.

** For these species, the following legislative requirements also apply: Duty to notify presence of prohibited matter (Part 4, Division 3, Clause 30, Biosecurity Act 2015): A Aperson who becomes aware of, or suspects, that a prohibited matter event has occurred, is occurring or is about to occur has a biosecurity duty to immediately notify the prohibited matter event in accordance with the requirements specified in the regulations.</td><td rowspan="15">• Establish agreed quarantine and/or hygiene protocols
• Surveillance and mapping to locate all infested properties
• Monitor progress towards eradication.
• High level analysis of pathways to identify potential introduction areas and preventative options</td></tr>
<tr><td>Groundsel bush Baccharis halimifolia</td></tr>
<tr><td>Pink pampas grass Cortaderia jubata</td></tr>
<tr><td>Blue hound’s tongue Cynoglossum creticum</td></tr>
<tr><td>Cats claw creeper Dolichandra unguis-cati (Macfadyena unguis-cati)*</td></tr>
<tr><td>Senegal tea plant, Temple plant Gymnocoronis splianthoides</td></tr>
<tr><td>Horsetail Equistum spp.</td></tr>
<tr><td>Spanish heath Erica lusitanica</td></tr>
<tr><td>Long-leafed water primrose Ludwigia longifolia</td></tr>
<tr><td>Ludwigia Ludwigia peruviana</td></tr>
<tr><td>Cane needle grass Nassella hyalina</td></tr>
<tr><td>Salvinia Salvinia molesta*</td></tr>
<tr><td>Giant Devil’s fig Solanum chrysotrichum</td></tr>
<tr><td>Spanish broom Spartium junceum</td></tr>
</table>

Regional Priority Weeds objective – CONTAINMENT:

These weeds are widely distributed in parts of the region. While broad scale elimination is not practicable, minimisation of the biosecurity risk posed by these weeds is reasonably practicable.

Species	Land area where requirements apply	Outcomes to demonstrate compliance with the GBD	Strategic Response in the region
Mysore thorn *Caesalpinia decapetala*	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong Local Government Area	**Whole region:** • Land managers mitigate the risk of new weeds being introduced to their land • The plant or parts of the plant are not traded, carried, grown or released into the environment * The following legislative requirement also applies to these species: ***Mandatory measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017)***: A person must not import into the State or sell any plant. **Within Exclusion zone:** • The plant is eradicated from the land, or if that is not practicable then as much of the plant as is practicable is destroyed and the spread of any remaining plant is suppressed **Within Core infestation area:** • Land managers reduce impacts from the plant on priority assets	**Within Exclusion zone:** • Establish agreed quarantine and/or hygiene protocols. • Surveillance and mapping to locate all infested properties and maintain currency of exclusion zone and objectives. • Monitor change in current distribution to ensure containment of spread. • High level analysis of pathways to identify potential introduction areas and preventative options **Within Core infestation area:** • Identification of key sites/assets in the geographic area • Identification of regional containment zones where required • Develop region-wide coordinated campaigns for collaborative management • Species managed in accordance with published weed management plan
Cabomba *Cabomba caroliniana**	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong, Shellharbour and Kiama Local Government Areas		
Scotch broom / English broom *Cytisus scoparius subsp. scoparius**	***Exclusion zone***: Bega Valley Local Government area ***Core infestation area***: Whole of region except exclusion zone		
Sea spurge *Euphorbia paralias*	***Exclusion zone***: Whole of region except core infestation ***Core infestation area***: Eurobodalla and Bega Valley Local Government Areas		
Flax-leaf broom, Mediterranean broom *Genista linifolia**	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong, Shellharbour, Kiama, Shoalhaven and Eurobodalla Local Government Areas		
Montpellier broom *Genista monspessulana**	***Exclusion zone***: Wingecarribee and Bega Local Government Areas ***Core infestation area***: Whole of region except exclusion zone		
Coolatai grass *Hyparrhenia hirta*	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong Local Government Area and localities of Bigga, Crooked Corner and Narrawa in the Upper Lachlan Local Government Area		
Lantana *Lantana camara**	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong, Shellharbour and Kiama Local Government Areas, and the part of Shoalhaven LGA north of 35 11'42"S (known as the Lantana National Containment Line, running east-west through the Princess Hwy / Bendalong Rd intersection)		
Fireweed *Senecio madagascariensis**	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wingecaribee, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley Local Government Areas		
Giant Parramatta grass *Sporobolus fertilis*	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area***: Wollongong, Shellharbour, Kiama, Shoalhaven and Eurobodalla Local Government Areas		
Gorse *Ulex europaeus**	***Exclusion zone***: Whole of region except core infestation area ***Core infestation area:*** Upper Lachlan, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla, Yass Valley and Bega Valley Local Government Areas		

Regional Priority Weeds objective – CONTAINMENT: *These weeds are widely distributed in parts of the region. While broad scale elimination is not practicable, minimisation of the biosecurity risk posed by these weeds is reasonably practicable.*			
Species	**Land area where requirements apply**	**Outcomes to demonstrate compliance with the GBD**	**Strategic Response in the region**
Serrated tussock *Nassella trichotoma**	***Exclusion zone***: Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley Local Government Areas ***Core infestation area*:** Whole of region except exclusion zone	**Whole region:** • Land managers mitigate the risk of new weeds being introduced to their land • The plant or parts of the plant are not traded, carried, grown or released into the environment * The following legislative requirement also applies to these species: ***Mandatory measure (Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017*:** A person must not import into the State or sell any plant. **Within Exclusion zone:** • Land managers prevent spread from their land **Within Core infestation area:** • Land managers reduce impacts from the plant on priority assets	**Within Exclusion zone:** • Establish agreed quarantine and/or hygiene protocols. • Surveillance and mapping to locate all infested properties and maintain currency of exclusion zone and objectives. • Monitor change in current distribution to ensure containment of spread. • High level analysis of pathways to identify potential introduction areas and preventative options **Within Core infestation area:** • Identification of key sites/assets in the geographic area • Identification of regional containment zones where required • Develop region-wide coordinated campaigns for collaborative management • Species managed in accordance with published weed management plan

Regional Priority Weeds objective – ASSET PROTECTION:

These weeds are widely distributed in the region. While broad scale elimination or containment is not practicable, preventing the spread to priority assets or reducing the impact on priority assets by weeds already present is reasonably practicable. Priority assets for protection typically have high environmental, economic and/or social value.

Species	Land area where requirements apply	Outcomes to demonstrate compliance with the GBD	Strategic Response in the region
African lovegrass *Eragrostis curvula*	Whole of region	Land managers reduce impacts from the plant on priority assets	• Identification of key sites/assets • Species managed in accordance with published weed management plan

Appendix 2: Other weeds of concern in the South East Local Land Services region

Appendix 2.1: Potential regional priority weeds

These species pose a potential biosecurity risk within the region however there is insufficient information on their distribution, pathways, impacts and/or feasibility of control to complete a regional risk assessment and inform an appropriate regional response.

Regional Strategic Response:

- Complete local surveys to determine the current distribution across the region
- Develop regional level weed risk assessments
- Determine the regional priority objective and whether the weed should be included in Appendix A1.2, A2.2 or simply managed under the GBD

Common name	*Scientific name*
Blue stars/Blue corn-lily	*Aristea ecklonii*
Chinese knotweed	*Persicaria chinensis*
Chinese violet	*Asystasia gangetica* subsp. *micrantha*
Glory lily	*Gloriosa superba*
Hymenachne	*Hymenachne amplexicaulis* and hybrids
Kudzu	*Pueraria lobata*
Ragwort	*Senecio jacobea*
Reed canary grass	*Phalaris arundinacea*
Sea wheatgrass	*Thinopyrum junceiforme*
Sicilian sea lavender	*Limonium hyblaeum*
Skunk vine	*Paederia foetida*
Water poppy	*Hydrocleys nymphoides*
White blackberry / Mysore raspberry	*Rubus niveus*
Yellow bells / Golden bells	*Tecoma stans*

Appendix 2.2: Species subject to local management programs

These species are high risk, high priority for a number of local programs and have significant environmental and/or animal health impacts. It is not possible to eradicate or contain these weeds across the region.

Regional Strategic Response:

- Work within existing widespread weed programs for strategic asset protection
- Prioritise actions under the GBD to assist with management
- Work with industry and the community to develop voluntary restrictions on sale and trade.

Common name	*Scientific name*
Arum lily	*Zantedeschia aethiopica*
Asparagus species*	Asparagus spp. (except *A. officianalis, A. racemosus, A. declinatus, A. falcatus & A. macowanii var. zuluensis*)*
Balloon vine	*Cardiospermum grandiflorum*
Blackberry*	*Rubus fruticosus* aggregate (except cultivars)*
Cape ivy	Delairea *odorata*
Chilean needle grass*	*Nassella neesiana**
Chinese celtis	*Celtis sinensis*
Creeping lantana	*Lantana montevidensis*
Crofton weed	*Ageratina adenophora*
Dolichos pea	*Dipogon lignosus*
Giant reed	*Arundo donax*
Green cestrum	*Cestrum parqui*
Honey locust	*Gleditsia triacanthos*
Madeira vine	*Anredera cordifolia*
Morning glory	*Ipomoea* spp
Moth vine	*Araujia sericifera*
Ox-eye daisy	*Leucanthemum vulgare*
Pampas grass (Common)	*Cortaderia selloana*
Rhus tree	*Toxicodendron succedaneum*
St. John's wort	*Hypericum perforatum*
Tree of heaven	*Ailanthus altissima*
Turkey rhubarb	*Acetosa sagittata*
Willows*	*Salix* spp.*

* The following legislative requirement also applies to these species: ***Mandatory measure (Part 2, Division 8, Clause 29, draft Biosecurity Regulation 2016):*** A person must not move, import into the State or sell any plant.

Appendix D

Fauna register

Table D.1 Fauna register

Date	Species	Condition	Status	Location found	Habitat found in	Location relocated to	Habitat relocated	Treatment required	Outcome/ treatment

Appendix E

Pathogen hygiene protocol

NSW GOVERNMENT

SAVING OUR SPECIES

Hygiene guidelines

Protocols to protect priority biodiversity areas in NSW from *Phytophthora cinnamomi*, myrtle rust, amphibian chytrid fungus and invasive plants

environment.nsw.gov.au/sos

Cover photo: Wollemi pine (*Wollemia nobilis*). Rosalie Nicolai/DPIE

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Foreword

This document sets out guidelines to reduce the risks of introducing pathogens (*Phytophthora cinnamomi*, myrtle rust and chytrid fungus) and invasive plants into new areas of New South Wales, especially those with susceptible threatened species, threatened ecological communities and areas of outstanding biodiversity value. The procedures in this document can also be applied to protect non-threatened species.

These guidelines promote the adoption of basic hygiene procedures into daily routines when working in the field. They are simple procedures to ensure potentially-contaminated material is not transferred to a new, susceptible area.

Under select circumstances, more strict hygiene procedures are recommended. These circumstances include when a general biosecurity eradication or containment effort is underway or when undertaking activities that could expose susceptible threatened species, threatened ecological communities or areas of outstanding biodiversity value to a new threat. Strict hygiene procedures are similar to the basic measures but include more thorough cleaning or disinfection.

These protocols and their application should be reviewed five years from the date of publication or if significant new information becomes available.

This document was developed as part of the NSW Government's *Saving our Species* program.

Who should use this guide?

This guide should be used by NSW Department of Planning, Industry and Environment (DPIE) employees, and contractors and volunteers undertaking works on behalf of DPIE, on public or private land.

This guide may also be used by private individuals or businesses working in conservation and revegetation, agriculture, construction, forestry, other primary industries or fields involving work in the agricultural or natural environments.

How to use this guide

Follow the steps below to determine which hygiene measures you should incorporate into your work plan. Clicking on an underlined word or phrase will take you to the relevant section of this document.

1. Read the section on planning considerations. This section provides information on what is likely to influence the risks a certain activity poses, but will not affect the level of hygiene recommended.
2. Read the section on determining your hygiene requirements, and review Appendix B and Appendix C to identify whether any species you are working with or near are susceptible to *Phytophthora cinnamomi* or myrtle rust infection. For *Phytophthora cinnamomi* and myrtle rust, use Decision tree 1 for Phytophthora and myrtle rust to determine which protocols are suitable for your work. If you are working on an island, use Decision tree 2 for visiting or working on islands. For invasive plants and amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), there are set protocols that should be applied in all circumstances.
3. Incorporate the relevant procedure(s) into your work activities.

Useful tools in this document

A list of species known to be susceptible to *Phytophthora cinnamomi* infection can be found at Appendix B.

A list of species known to be susceptible to myrtle rust infection can be found at Appendix C.

Lists of significant invasive non-native plants can be found at Appendix A and Appendix D.

Additional advice for working with and handling amphibians can be found at Appendix E.

A template for a hygiene management plan can be found at Appendix F.

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Introduction

Purpose

This document provides guidance for people undertaking activities that have the potential to spread or introduce specific pathogens or invasive plant propagules in the natural environment of New South Wales. The protocols outlined in this document are recommended to ensure the risks of spreading pathogens and invasive plants are effectively managed to protect biodiversity in New South Wales.

Objective

The objective of these guidelines is to outline hygiene practices that can help avoid or minimise introduction of pathogens or invasive plants to areas in New South Wales with threatened species and threatened ecological communities. The guidelines were developed to address the following key threatening processes (KTPs) listed under the *Biodiversity Conservation Act 2016* (BC Act):

- infection of native plants by *Phytophthora cinnamomi*
- introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae (myrtle rust)
- infection of frogs by amphibian chytrid causing the disease chytridiomycosis (chytrid fungus).

These guidelines can also be applied to invasive plant-related KTPs (see Invasive plants) and invasive plants identified in National Parks and Wildlife Service branch pest management strategies. They may also have relevance to other disease and pest (including invertebrate and microbial pest) organisms, particularly those borne in soil or water, although these may require additional case-specific protocols (see Biosecurity Hotline contacts below).

The protocols in this document are also relevant to a number of KTPs listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Use of these guidelines may also reduce the risk from a number of pathogens and diseases yet to arrive in Australia, but assessed as being likely to do so and of high environmental risk (see Priority list of exotic environmental pests and diseases, last reviewed 4 February 2020).

For more general information on managing disease risks in wildlife, including hygiene recommendations, see the National Wildlife Biosecurity Guidelines (PDF 2.3MB) (Wildlife Health Australia 2018).

Scope and application

In New South Wales, the most practical, outcomes-based approach to hygiene is to focus on protecting areas that are: (1) not infested, (2) habitat for threatened species and threatened ecological communities, and (3) not subject to high visitation by people. The protocols in this document can help to achieve this for *Phytophthora cinnamomi*, myrtle rust, chytrid fungus and invasive plants. They may also be useful in reducing risks associated with other pathogens. In the latter case, further information about the risks of transmission will help determine when and where the protocols should be applied.

Some sites or projects may require a specific hygiene management plan. If a hygiene management plan has been developed for your site or project, that plan should take precedence. This document is a guide and should not replace the development of specific hygiene management plans for areas, sites and projects. A template for a hygiene management plan can be found at Appendix F. The template can be used to record the specific hygiene actions for your work.

Hygiene measures should be applied by people working in areas of high biodiversity importance across New South Wales, where appropriate (see Determining your hygiene requirements). People working with Bellinger River snapping turtles (*Myuchelys georgesi*) in the Bellinger River may need to take extra hygiene precautions due to the presence of Bellinger River virus. Those people should first contact the NSW Department of Primary Industries Aquatic Biosecurity Hotline on 02 4916 3877 or 131 555 or by email to confirm what hygiene precautions they should take.

This document does not:

- address biosecurity risks associated with handling animal biological samples, carcasses and waste (see the National Wildlife Biosecurity Guidelines (Wildlife Health Australia 2018) for general information on managing those risks)
- address the risks that native and pest animals play in transferring pathogens and invasive plants between locations, but acknowledges that control of pest animals may be important in reducing the spread of pathogens and invasive plants in some landscapes
- provide species-specific guidance for invasive plants
- replace the benefit or need for developing tailored landscape-, project- or site-specific hygiene management strategies for pathogens and invasive plants.

Pathogens

Pathogens are organisms that can cause disease, and they have the potential to cause significant declines in species and disrupt ecological communities. Preventing entry of pathogens is always the most cost-effective management strategy; however, when pathogens are detected, eradication should be the next option considered, followed by containment (when eradication is not feasible). When containment is not feasible, protecting susceptible threatened species, threatened ecological communities and areas of outstanding biodiversity value is of paramount importance.

Phytophthora cinnamomi

Phytophthora cinnamomi (Phytophthora) is a soil-borne water mould that attacks the roots of susceptible plants, destroying the root system and reducing the ability of the plant to conduct water and nutrients, which can sometimes kill the infected plant (Makinson 2018b).

Any activity that moves soil or plant matter can spread Phytophthora. Clothing, equipment, footwear and vehicles that can carry soil are potential vectors for transmission (NSW TSSC 2011). In most situations, Phytophthora is impossible to eradicate from infested areas, so the current approach to management aims to prevent its introduction to unaffected areas to protect threatened species and ecological communities that are most at risk.

The development of phytosanitary protocols to reduce risks of spreading Phytophthora is a strategic objective of the draft *Saving our Species* (SoS) Phytophthora KTP strategy. This document directly addresses that objective.

Other *Phytophthora* species (e.g. *P. aggregate*, *P. multivora*) are emerging as threats to biodiversity in New South Wales. They have similar dispersal characteristics to *P. cinnamomi* and so the application of hygiene measures outlined in this document will be effective in also containing their spread.

Myrtle rust

Myrtle rust is a disease caused by the fungus *Austropuccinia psidii* (Beenken 2017; Makinson 2018b). It affects trees and shrubs in the Myrtaceae family by attacking young, soft, actively-growing leaves, shoot tips, young stems, fruits and flower parts.

The primary vector of myrtle rust at local and intermediate scales is wind (Makinson 2018b; Pegg et al. 2014); however, myrtle rust spores can quickly spread via people on contaminated clothing, footwear, tools, vehicles and machinery, as well as on animals. While good hygiene practices cannot control the spread of myrtle rust by wind, they can help slow the spread by people to areas that are not yet infested.

The hygiene management approach outlined in this document is consistent with Action 2 of the Management plan for myrtle rust on the national parks estate (PDF 1.4MB) to limit the spread of myrtle rust from infested sites and limit the introduction of myrtle rust to non-infested sites (OEH 2015). No hygiene actions have been identified in the draft SoS myrtle rust KTP strategy; nevertheless, it is important to enact due diligence and ensure it is not spread to areas with susceptible species through poor hygiene. The protocols set out in this document are also consistent with the draft action plan for myrtle rust in Australia (Makinson 2018a).

Amphibian chytrid fungus

Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) is a fungal pathogen that causes the disease chytridiomycosis, which has led to the decline and extinction of frog populations globally and in Australia (OEH 2018). Chytridiomycosis has been detected in over 40 species of native Australian frogs (DECC 2008).

The fungus is transferred by direct contact between frogs and tadpoles or via zoospores in infected water (OEH 2018). Humans can spread the disease by contaminated footwear and equipment and by (illegally) moving frogs from one area to another.

Batrachochytrium dendrobatidis is listed as prohibited matter under the *Biosecurity Act 2015*. Consequently, it is an offence to knowingly spread chytrid in New South Wales. Implementing the protocols detailed in this document will help people to carry out their general biosecurity duty to prevent, eliminate or minimise risk posed by chytrid fungus.

The protocols outlined in this document replace the *Hygiene protocol for the control of disease in frogs* (DECC 2008).

Invasive plants

Invasive plants are (generally) non-native to Australia and have an adverse effect on, or are suspected of having an adverse effect on, the environment, the economy or the community (Biosecurity Act). The financial impact of invasive plants in New South Wales on agriculture alone is approximately $4.3 million every year (DPI 2017). Impacts on the environment have not been quantified but are likely equal to or greater than those on agriculture. Many invasive plants can occupy natural areas and disturb ecosystems by altering plant and animal community composition, nutrient cycles and fire regimes (DoE 2015).

Invasive plants can be spread by dispersal of seed and vegetative material on wind, animals, waterways and people (via contaminated clothing, hats, footwear, tools, equipment, machinery and vehicles; DoE 2015). Although non-human vectors are difficult to control, the dispersal capacity of humans can be reduced by modifying behaviour. Implementing hygiene protocols will assist with controlling the spread of invasive plants by preventing the transportation of plant material that is capable of proliferating in new sites. The primary approach to preventing spread of invasive species is through effective project planning and cleaning of clothing, equipment and vehicles.

The following KTPs under the BC Act involve one or more invasive plant species:

- invasion and establishment of exotic vines and scramblers
- invasion and establishment of Scotch broom (*Cytisus scoparius*)
- invasion, establishment and spread of lantana (*Lantana camara* L. *sens*. *lat*.)

- invasion of native plant communities by African olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.
- invasion of native plant communities by *Chrysanthemoides monilifera*
- invasion of native plant communities by exotic perennial grasses
- loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

Some invasive plants may be subject to targeted eradication or containment programs and may have increased hygiene requirements. Outside of those programs, the procedures in these guidelines can be used to reduce the likelihood of spreading invasive plants to new areas.

Invasive plants in New South Wales are regulated under the *Biosecurity Act 2015*. The Biosecurity Act establishes the concept of a 'general biosecurity duty', which requires that any person who deals with (e.g. possesses, breeds, propagates, moves, displays, acquires) a plant and knows (or ought to know) of any biosecurity risks associated with the plant, has a duty to ensure the risk is prevented, eliminated or minimised, as far as is reasonably practical.

Some invasive plants are listed as 'prohibited matter' under the Biosecurity Act. Invasive plants that are prohibited matter are more heavily-regulated than other invasive plants. Any dealing with prohibited matter (including movement) in New South Wales is an offence. Any person who becomes aware of or suspects the presence of prohibited matter must notify the Department of Primary Industries immediately on 1800 680 244 or by email at weeds@dpi.nsw.gov.au. Visit NSW WeedWise for details of the biosecurity duties for each invasive plant species.

See Appendix D for a list of invasive non-native plants that are listed as prohibited matter. You can contact the Botanical Information Service (Royal Botanic Gardens and Domain Trust) at botanical.is@rbgsyd.nsw.gov.au to confirm plant identification and lodge voucher specimens in the National Herbarium of New South Wales.

Hygiene management

Hygiene refers to specific measures to prevent the spread of pathogens and invasive plant propagules by removing seeds, spores, contaminated soil, water, and organic materials from machinery, vehicles, equipment, footwear and clothing.

The appropriate level of hygiene (basic or strict) is dependent on whether the location is already infested and whether you are working near any susceptible threatened species, threatened ecological communities or declared areas of outstanding biodiversity value, as well as any non-listed species known to be highly susceptible to a pathogen or threat process (susceptible high-risk entities). A list of known susceptible high-risk entities can be found at Appendix B (for *Phytophthora cinnamomi*) and Appendix C (for myrtle rust).

Where a pathogen is not present at a site but there are susceptible animals or plants present, hygiene measures should be more stringent.

Maintaining good hygiene is consistent with the management principles for national parks, historic sites, state conservation areas, regional parks, karst conservation areas, nature reserves and Aboriginal land set out in the *National Parks and Wildlife Act 1974*. Those management principles include conserving natural values and conserving biodiversity, maintaining ecosystem function and maintaining natural landscapes.

Good hygiene standards are also consistent with the national standards for implementing ecological restoration activities (Standards Reference Group SERA 2017).

Planning considerations

Below is a list of factors that can decrease the likelihood of transmitting pathogens and invasive plants. It is not intended as a list of activities prescribed by this document for all circumstances (because they may be impractical in many cases) but can help readers recognise risk factors when planning and undertaking their work.

Factors that can reduce the risk of introducing or spreading pathogens or invasive plants include:

- scheduling work during dry weather (and not immediately following wet weather) to reduce adhesion of soil to footwear, clothing, equipment and vehicles
- (when working across multiple field sites) visiting known non-infested sites first, followed by sites with unknown infestation status and lastly sites known to be infested
- scheduling activities so they do not immediately follow warm, moist conditions (which are favourable for spore production) or during times of peak seed production by invasive plants
- restricting movement of soil and plant material to and from a site
- keeping vehicles, machinery and people to dry surfaces, formed roads and walking trails
- maintaining drainage to prevent flooding or pooling
- planning to use methods that minimise soil disturbance.

Additional planning considerations for fire management work

The primary focus of emergency bushfire operations is the protection of life and property. It is rarely practical to implement strict hygiene procedures under those circumstances; however, it is advisable to maintain a basic level of hygiene wherever practical to reduce the spread of plant pathogens.

For non-emergency fire management practices (e.g. prescribed burning, firebreak construction and maintenance), appropriate hygiene measures should be incorporated. We recommend using Decision tree 1 and/or Decision tree 2 (when relevant) to identify suitable hygiene measures before undertaking fire management activities.

There are additional fire management planning actions that can be considered to reduce risks of spreading plant pathogens and invasive plants. These include:

- avoiding construction of firebreaks near susceptible threatened species and threatened ecological communities, where practical and where it does not increase risk to life and property
- constructing firebreaks in areas with good drainage
- preferentially burning areas bound by well-formed hard surfaces.

Determining your hygiene requirements

During the project planning phase, it is important to determine whether basic or strict hygiene protocols are appropriate. For example, when working in areas unsuitable for establishment of a pathogen or invasive plants, it may not be necessary to implement strict hygiene measures. Basic hygiene protocols should always be applied at a minimum.

You can use the hygiene management plan at Appendix F to summarise the relevant risks and record the recommended hygiene measures for your project.

Phytophthora cinnamomi

Phytophthora cinnamomi (Phytophthora) establishment typically occurs in areas with warm conditions (optimal spore production occurs at 24–25°C under laboratory conditions; Nesbitt et al. 1979) and average annual rainfall of >500 millimetres (*Phytophthora* Technical Group 2006). In New South Wales, Phytophthora has established in the following Local Land Services regions:

- Greater Sydney (including the Greater Blue Mountains World Heritage Area; Newby 2014)
- Hunter
- North Coast
- Northern Tablelands
- Central Tablelands
- South East.

Phytophthora is also present in parts of the Central West, Riverina and Murray regions.

Strict hygiene measures are recommended at sites in these regions where:

- susceptible high-risk entities exist
- Phytophthora is not present
- there is no public access OR there is public access with hygiene measures already in place (e.g. boot-cleaning stations)
- environmental conditions are conducive to the establishment of Phytophthora.

The aim of this approach is to reduce the introduction of Phytophthora to non-infested areas.

Decision tree 1 can help you determine your hygiene requirements with respect to Phytophthora; however, if working on an island, see Visiting or working on islands.

Myrtle rust (*Austropuccinia psidii*)

There are varied reports of climatic preferences for myrtle rust spore germination (Makinson 2018b). For example, Kriticos et al. (2013) found that laboratory germination occurred between 8.8 and 29.7°C, but was optimal between 12 and 20°C. Ruiz et al. (1989) reported a thermal tolerance range of 5–25°C on a eucalypt host. Myrtle rust prefers moist environments and incidence tends to decrease during dry periods (Carnegie et al. 2016).

Myrtle rust has established throughout coastal New South Wales (including some areas of the lower Blue Mountains) and spores are likely to have spread throughout almost all moist terrestrial habitats in the region due to high dispersal capacity by wind (DPI 2015). Consequently, it is not always practical or cost-effective to implement strict hygiene procedures for myrtle rust in this region.

Hygiene measures can go some way to reducing the spread of myrtle rust to some non-infested areas such as potential habitat on or west of the Great Dividing Range in New South Wales and jurisdictions not yet affected by myrtle rust (e.g. South Australia and Western Australia). Before travelling to other states and territories not affected by myrtle rust, you should launder all of your fieldwork clothes if you have been working in an area infested with myrtle rust.

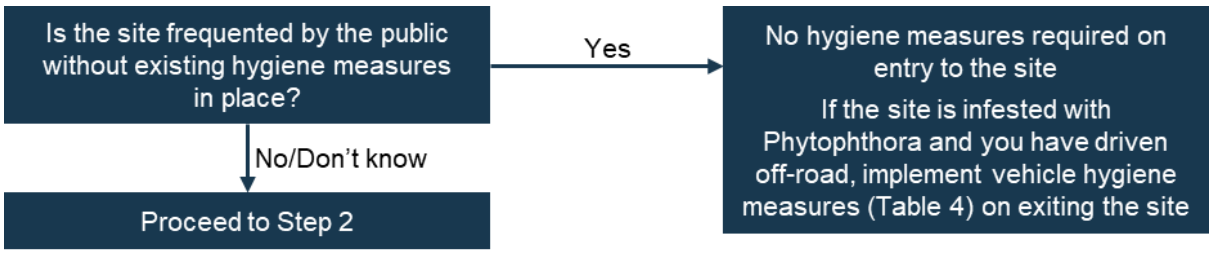
The far south-west of Western Australia contains approximately 40% of Australia's myrtaceous species (Makinson 2018b). Consequently, if introduced, myrtle rust has the potential to cause significant damage to the region. The continued exclusion of the pathogen from south-west Western Australia is a national biosecurity priority.

Decision tree 1 can help you determine your hygiene requirements with respect to myrtle rust; however, if working on an island, see Visiting or working on islands.

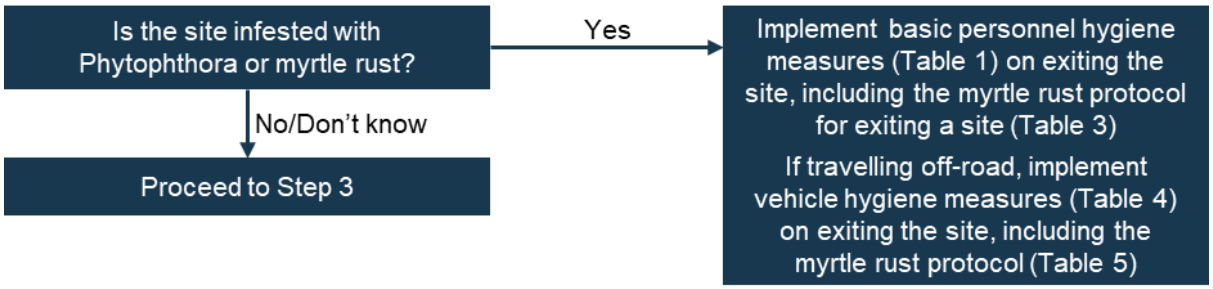
Decision tree 1: Phytophthora and myrtle rust

This decision tree should only be used when there is no site-specific hygiene protocol for the area you are visiting or working in.

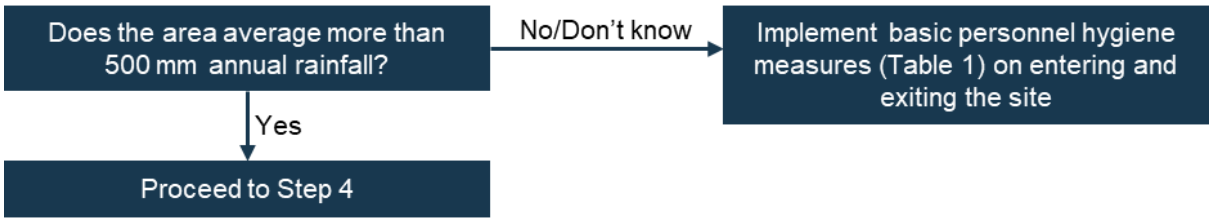
Step 1: Determine nature of public access



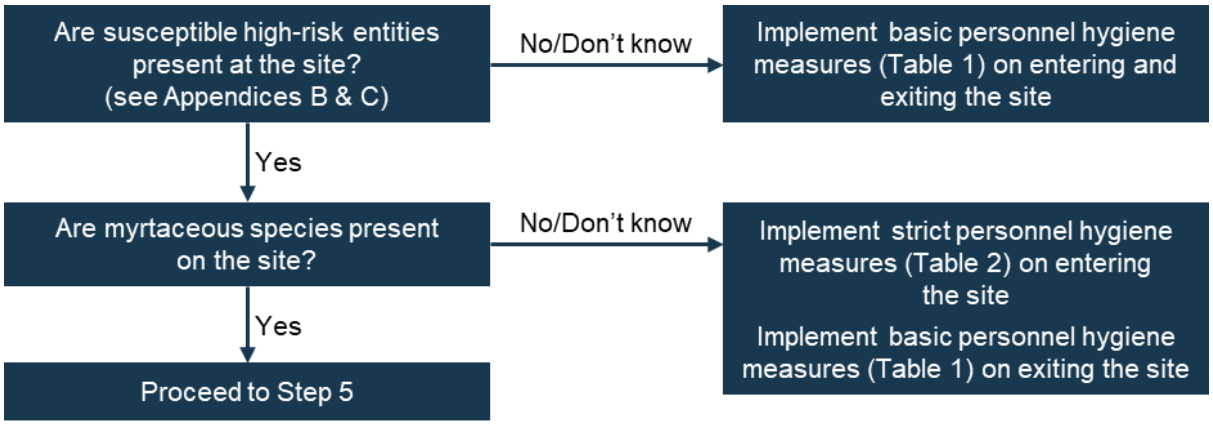
Step 2: Determine presence of Phytophthora or myrtle rust



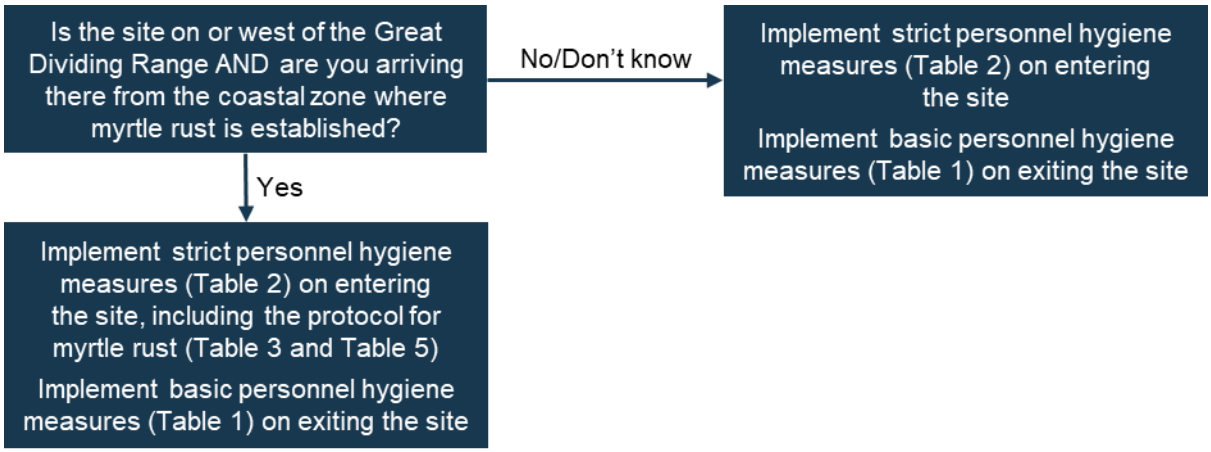
Step 3: Determine average annual rainfall



Step 4: Determine presence of susceptible entities and/or myrtaceous species



Step 5: Determine risk of spread of myrtle rust to or beyond the Great Dividing Range



Invasive plants

Appendix A and Appendix D list invasive plants listed as KTPs or prohibited matter under the BC Act and Biosecurity Act, respectively. It is recommended that hygiene measures are implemented whenever working with these species or in areas where these species occur.

The basic hygiene procedure (Table 1) and the vehicle hygiene procedure (Table 4) recommend checking and removing seed and plant debris from clothing, footwear, equipment and vehicles. These measures are sufficient to remove invasive plant propagules under most circumstances, but people should be particularly vigilant when checking and cleaning after work on sites with KTP-listed plants, weeds of national significance or regional priority invasive plants (see the NSW WeedWise website).

During peak seed production, consideration should be given to additional measures, such as designating site-specific shoes, clothing or equipment that are used only at a single site and are bagged prior to leaving that site. When operating heavy machinery that captures a lot of soil in an infested site, implement strict vehicle hygiene measures (Table 4).

Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*)

Reducing the spread of amphibian chytrid fungus between sites and between frogs should be a central objective when working with or near amphibians or in habitats where amphibian chytrid fungus is pervasive. Consequently, strict hygiene should be practised under all circumstances for personnel, clothing, footwear, tools and equipment. See Table 6 for details; however, if working on an island, see Visiting or working on islands.

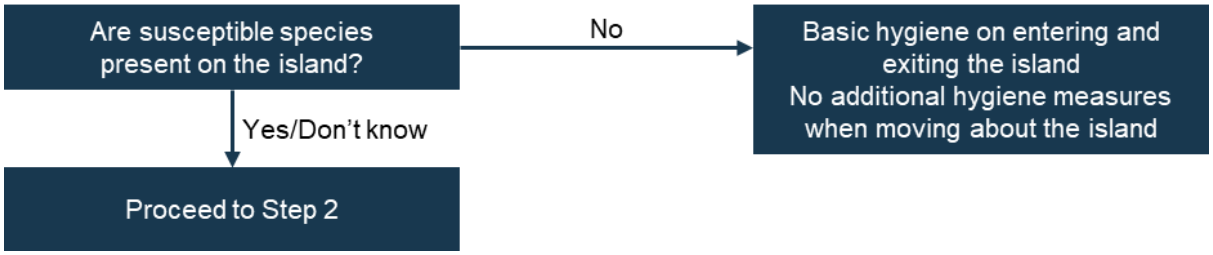
Visiting or working on islands

When visiting or working on islands, the recommended level of hygiene depends on whether or not the island is affected by pathogens and if so, to what extent. In some cases, this may be difficult to determine, so a cautious approach may be sensible. Decision tree 2 is a general guide to the 'when' and 'what' of hygiene on islands. It can be applied to Phytophthora, myrtle rust and amphibian chytrid fungus. For invasive plants, follow the advice above under Invasive plants.

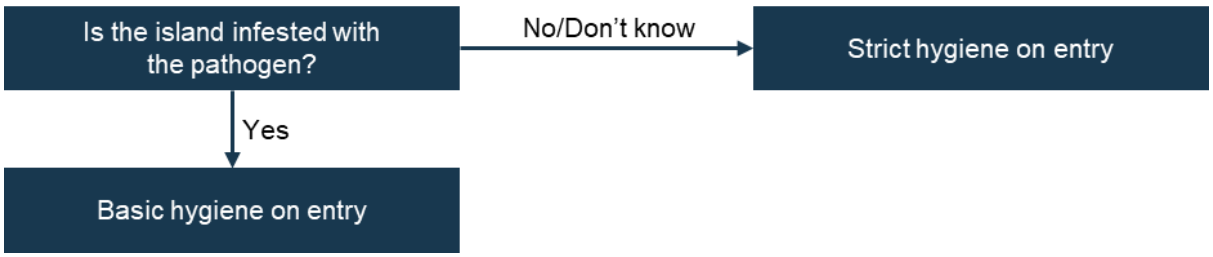
Where hygiene measures are recommended for moving about an island (see Step 3 below), it will be important to establish hygiene points at the boundary of the infested area(s).

Decision tree 2: visiting or working on islands

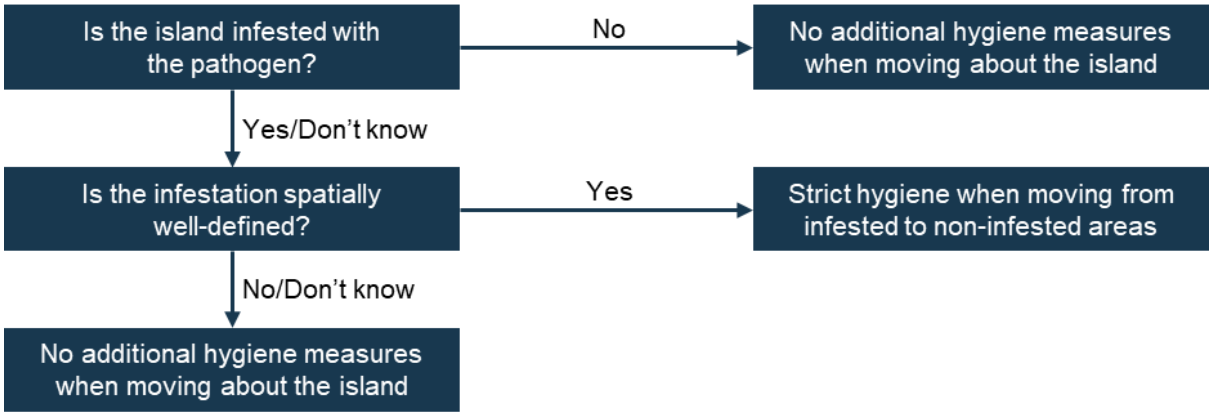
Step 1: Determine presence of susceptible species



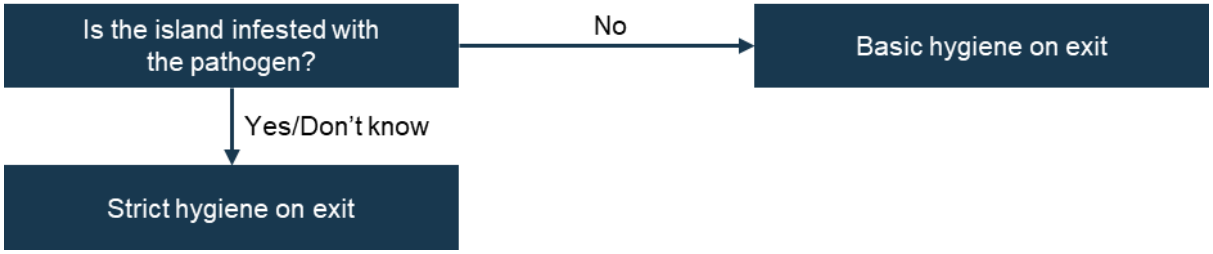
Step 2: Determine hygiene measures before entry to the island



Step 3: Determine hygiene measures for moving about the island



Step 4: Determine hygiene measures for exit from the island



Recommended hygiene protocols

Personnel, clothing, footwear, tools and equipment

Basic hygiene measures

Table 1 Basic hygiene protocol for personnel, clothing, footwear, tools and equipment

Step	Description
1. Check	• Check personnel, clothing, footwear, backpacks and equipment for soil, plant material/propagules and other debris.
2. Clean	• Remove all soil, plant material and other debris using a hard brush and (if required) clean water. • If dirty, wash hands with soap and water[1]. • Remove seeds from clothing, footwear, tools and equipment by hand. Seeds that are difficult to remove can sometimes be scraped off clothing with a sharp implement (e.g. a knife), but use caution. Where possible, have a co-worker double-check that you have removed all seeds.
3. Dry	• Where practical, ensure hands, clothing, footwear, and equipment are dry before proceeding.

Strict hygiene measures

Where possible, strict hygiene procedures should be implemented at a set hygiene point at the site boundary. The site boundary should be defined by the project or site manager. It could be the boundary of a national park. If not on-park, the boundary could be identified based on the distribution of the threatened entities at risk. Where a site boundary is unclear, it should be determined at the project or site manager's discretion.

Where possible, disinfectant should be applied and disposed of in a dry area that is at least 30 metres from a waterway or drainage channel, and where there is limited possibility of it running into a waterway or sensitive environmental area. The complete elimination of all spores on contaminated materials (e.g. boots, vehicles) is an unreasonable expectation, so the goal of disinfection is to *reduce* the spore load present.

Table 2 Strict hygiene protocol for personnel, clothing, footwear, tools and equipment

Project planning

Step	Description
1. Check	• Ensure you have a fully stocked hygiene kit, or easy access to one.
2. Select	• Where practical, select clothing, footwear, tools and equipment that are easy to clean (e.g. non-absorbent).
3. Clean	• Make sure all equipment is clean before use (routinely following this protocol will achieve this).

[1] For general information on hand hygiene, refer to the *National Wildlife Biosecurity Guidelines* (Wildlife Health Australia 2018).

Table 2, continued…

Protocols

Step	Description
1. Check	• Thoroughly check all clothing, footwear, backpacks tools and equipment for soil, water, organic material or other debris. Where possible, have a co-worker double-check for you.
2. Clean	• Remove all soil, water, organic material and debris using a hard brush and clean water. • Remove any residual seeds from clothing, footwear, tools and equipment by hand. Where possible, have a co-worker double-check that you have removed all seeds. • If dirty, wash hands with soap and water.
3. Disinfect	• Spray or soak potentially contaminated materials (e.g. footwear, equipment) with disinfectant (Table 7). Leave for 30 seconds before proceeding. • Where practical, rinse with clean water.
4. Dry	• Where practical, ensure all personnel, clothing, footwear, tools and equipment are dry before proceeding.

Myrtle rust

Decision tree 1 identifies when hygiene measures specifically for myrtle rust should be considered. Generally, this will only be after visiting a site that is infested with myrtle rust or when travelling from an infested area to a non-infested site.

Table 3 Myrtle rust hygiene protocol for personnel, clothing, footwear, tools and equipment

Step	Description
1. Disinfect	• Spray equipment and clothing with disinfectant.
2. Clean	• At the end of the day, launder all hats and clothing using detergent and warm or hot machine wash to kill residual spores. • At the end of the day, shower thoroughly to remove residual spores from skin and hair.

Vehicles and heavy machinery

Generally, protocols for vehicles and heavy machinery (Table 4) only need to be implemented when you have driven off-road. The myrtle rust protocol (Table 5) is an exception and should be implemented whenever you have driven in a site infested with myrtle rust, because spores can adhere to clothing and be transferred to the vehicle's interior.

Table 4 Hygiene protocol for vehicles and heavy machinery

Step	Description
1. Check	• Check the exterior and interior of vehicles and machinery for soil, plant material and other debris. Use Figure 2 as a guide for where to focus your attention.
2. Clean	• Remove large clods of dirt and soil using a stiff brush or crowbar. • Remove all soil, plant material and other debris from the interior using a vacuum or dustpan and brush. Focus on the cabin floor, floor mats and pedals. Place debris in a bag and dispose of in a commercial waste bin. • *If returning from a potentially-contaminated area*, wash vehicle and/or machinery as soon as possible (e.g. at a commercial carwash) before heading back to base. If a carwash facility is not available, spray tyres thoroughly with a disinfectant (Table 7). • *If leaving a potentially-contaminated area and travelling to a new site*, reassess your hygiene requirements using Decision tree 1 for Phytophthora and myrtle rust.
3. Dry	• Where practical, allow vehicle or machinery to dry before proceeding.

Myrtle rust

Table 5 Myrtle rust hygiene protocol for vehicles and heavy machinery

Step	Description
1. Disinfect	• Use 70% alcohol wipes or a spray bottle to apply disinfectant (Table 7) to the interior of vehicle (focus on seats, steering wheel, gear stick, pedals and floor). • Spray the exterior with disinfectant or hand pressure sprayer. Allow the disinfectant to remain in contact with the surface for at least 30 seconds before rinsing with clean water.

Amphibian fieldwork

Table 6 Strict hygiene protocols for undertaking amphibian fieldwork

Project planning

Step	Description
1. Select	• Where practical, select clothing, footwear, tools and equipment that are easy to clean (e.g. non-absorbent). • Where practical, when visiting multiple sites, pack separate sets of equipment (including shoes) for use at each site.

Before arriving at a site and on leaving a site

Step	Description
1. Check	• Thoroughly check all personnel, clothing, footwear and equipment for soil, water, organic material or other debris. Where possible, have a co-worker double-check for you.
2. Clean	• Remove all soil, water, organic material or other debris using a hard brush and clean water.
3. Disinfect	• Spray or soak potentially-contaminated materials with disinfectant (Table 7). Leave for 30 seconds before proceeding. Where practical, rinse with clean water.
4. Dry	• Where practical, ensure all clothing, footwear, tools and equipment are dry before proceeding.

When in the field

- Wear disposable, non-powdered gloves when handling amphibians.
- Use new gloves or a new bag for handling each individual amphibian.
- Wear well-rinsed (with water) vinyl gloves when handling tadpoles.
- If gloves are not available, wash hands with 70% alcohol between handling each animal. Make sure hands are dry before handling amphibians as alcohol exposure may be toxic to them. Rinse hands with potable water (if available) after disinfecting.
- Keep individual amphibians in separate containers. Dispose of containers after use.
- Where possible, keep tadpoles in separate containers. If necessary, tadpoles from the same pond or stream section can be grouped in one container but avoid overcrowding.
- Never mix amphibians from different sites.
- Amphibians should be released where they were captured.
- If using toe clipping or Passive Integrated Transponder (PIT) tagging, use disinfected instruments (preferably unused disposable instruments). Open wounds should be sealed using an appropriate tissue adhesive, followed by application of a topical anaesthetic disinfectant.

Hygiene tools

Hygiene kits

A simple hygiene kit should be kept in each field vehicle to allow staff to implement hygiene measures as required. At a minimum, hygiene kits should contain a stiff brush (for removing soil from boots, bags, etc.), a spray bottle and a container of disinfectant solution (with enough volume for several refills of the spray bottle).

A more comprehensive hygiene kit should include:

- stiff brush
- nail brush
- dustpan (for removing soil from vehicle interior)
- spray bottle
- container of disinfectant solution (enough for several refills of spray bottle)
- container of clean water (for disinfectant dilution and hand washing)
- disposable garbage bags for waste
- plastic tubs that can be used to carry items and for soaking equipment
- alcohol wipes or gel
- soap
- towel
- disposable gloves for handling disinfectant (long-arm waterproof gloves can further reduce risk of skin exposure when diluting disinfectant)
- non-powdered gloves (if working with amphibians).

Disinfectants

Disinfectants should be used for personnel, field equipment and tools, clothing, footwear, vehicles, machinery and personal items to reduce the number of residual spores and other pathogens. For disinfectants to be effective, all surfaces must first be cleaned of soil and organic matter.

All people must take reasonable care for their health and safety, and the health and safety of others, by following product safety instructions and wearing appropriate personal protection equipment when preparing and using disinfectants. Commercially-available fungicides should generally not be mixed with other chemicals (unless the manufacturer explicitly states it is safe to do so). This is especially important for chlorine-based compounds as these may produce toxic vapours when mixed with fungicides (Allan & Gartenstein 2010).

Table 7 Disinfectants

Disinfectant	Application	Notes
70% methylated spirits in water	Spraying absorbent and non-absorbent materials, including vehicle interiors. Can also be used to disinfect hands.	Store in a closed container to reduce evaporation. Solutions at lower or higher concentrations may be less effective or even completely ineffective. Can be used on clothing.
1% sodium hypochlorite in water	Soaking non-absorbent materials	Dilution of household bleach is sufficient. Use only in a well-ventilated area. Do not use on clothing. Bleach has a limited shelf life. Degradation increases with exposure to UV light and at higher temperatures. See manufacturer's details for further information.
Benzalkonium chloride (various concentrations)	Spraying or soaking materials (e.g. equipment, vehicles, boot-cleaning stations)	Some commercial fungicidal products are available (e.g. Phytoclean®). Use as per manufacturer's instructions. Avoid contact with skin or items likely to come into contact with skin (e.g. clothing).
Industrial strength detergent	Cleaning and disinfecting vehicle exteriors, shoes and equipment	There are several commercial products available. Use as per manufacturer's instructions.
Chloramine and chlorhexadine-based products	Disinfecting hands, footwear and equipment	Examples include *Halamid*®, *Halasept*® and *Hexifoam*®. Use as per manufacturer's instructions.
Alcohol wipes	Wiping down vehicle interiors	For multi-use packets, ensure the packaging is properly sealed between uses.
Alcohol gel	Disinfecting hands	

Boot-cleaning stations

Installation of boot-cleaning stations along popular walking trails can help to mitigate the risk of bushwalkers spreading Phytophthora and other soil-borne pathogens, as well as some invasive plant propagules. Where present, they are a suitable alternative to a stiff brush for cleaning boots. Boot-cleaning stations can vary in complexity from simple systems with fixed brushes that people can use to scrub their shoes (see Figure 1), or a bench with a hand brush attached by chain, to mechanisms that deliver disinfectant to footwear (O'Gara et al. 2005). Boot-cleaning stations accompanied by instructional material and signage about Phytophthora increase awareness and provide context for users, and may increase compliance (Massenbauer 2018).

It is recommended that disinfectant solutions in boot-washing stations are regularly monitored and replaced as necessary. Solutions may need to be replaced more frequently in high traffic areas.

Figure 1 Boot-cleaning station in Barrington Tops National Park

Photo: Peter Beard/DPIE

Vehicle and machinery cleaning checklist

When you are likely to drive off-road or use heavy machinery, it is useful to develop a cleaning checklist during the planning phase of the project. The checklist should include components of the vehicle or machinery that are likely to come into contact with soil or plant material, whether through direct contact (e.g. tyres) or by transfer (e.g. cabin floor, gear stick). An example illustrated cleaning checklist can be found at Figure 2.

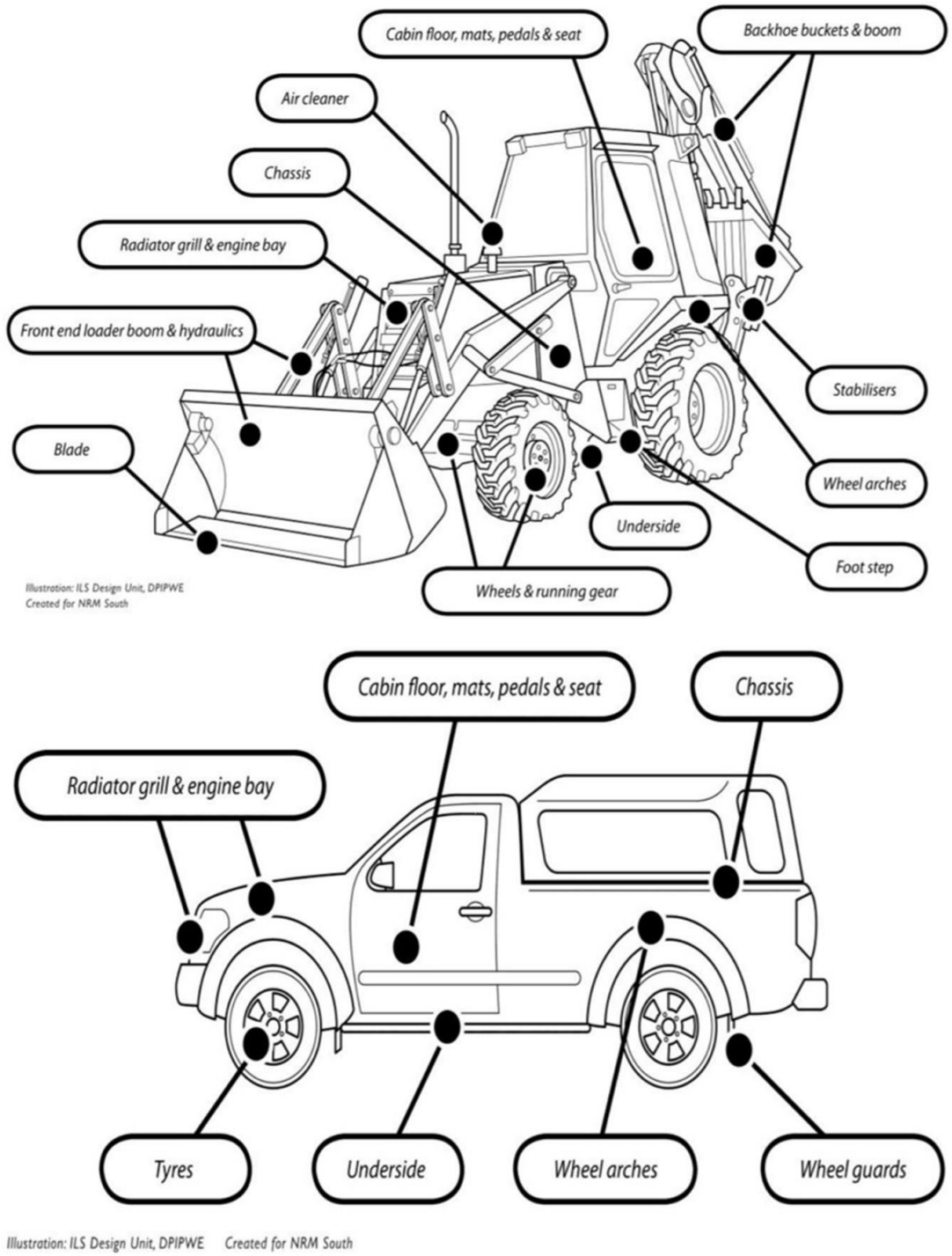


Figure 2 Example illustrated machinery and vehicle cleaning checklists

These are the parts of the vehicle that should be checked and cleaned. Reproduced from DPIPWE (2015) with permission. Original image credit: Allan and Gartenstein (2010).

Appendix A: Legislation

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the primary piece of legislation that protects biodiversity in New South Wales. One of the purposes of the BC Act is to assess the extinction risk of species and ecological communities, and identify key threatening processes (KTPs), through an independent and rigorous scientific process (BC Act s.1.3(f)).

A threat may be listed as a KTP if, in the opinion of the Threatened Species Scientific Committee (NSW TSSC), it:

- adversely affects threatened species, populations of a species or ecological communities
- could cause species, populations of a species or ecological communities to become threatened.

There are several pathogen and weed-related threats that are listed KTPs under the BC Act, including:

- infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- infection of native plants by *Phytophthora cinnamomi*
- introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
- invasion and establishment of exotic vines and scramblers
- invasion and establishment of Scotch broom (*Cytisus scoparius*)
- invasion, establishment and spread of lantana (*Lantana camara* L. *sens. lat*)
- invasion of native plant communities by African olive (*Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.)
- invasion of native plant communities by *Chrysanthemoides monilifera*
- invasion of native plant communities by exotic perennial grasses
- loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

Division 6 of Part 4 of the BC Act establishes the Biodiversity Conservation Program, known as *Saving our Species* (SoS). The objectives of SoS are:

1. to maximise the long-term security of threatened species and ecological communities in nature and
2. to minimise the impacts of KTPs on biodiversity and ecological integrity.

This document helps to achieve the second objective of SoS by outlining means of reducing the introduction and spread of pathogens and invasive plants throughout New South Wales.

National Parks and Wildlife Act 1974

The main act governing the management of national parks and reserves in New South Wales is the *National Parks and Wildlife Act 1974* (NPW Act). The NPW Act contains provisions for the reservation of land as:

- a national park
- a historic site
- a state conservation area
- a regional park
- a karst conservation reserve
- a nature reserve
- an Aboriginal area.

The National Parks and Wildlife Service administers the NPW Act and is responsible for managing reserved land. Implementation of hygiene measures in national parks helps to meet the obligation to manage national parks in accordance with the management principles set out in Division 2 of Part 4 of the NPW Act, which include conserving biodiversity, maintaining ecosystem function and maintaining natural landscapes.

Biosecurity Act 2015

The *Biosecurity Act 2015* provides a framework for managing biosecurity risks in New South Wales while promoting that biosecurity is a shared responsibility between government, industry and the public. The Biosecurity Act establishes the general biosecurity duty (s.22), which requires any person who knows or ought to know about a biosecurity risk to (so far as is reasonably practical) ensure that risk is prevented, eliminated or minimised.

The Biosecurity Act also establishes prohibited matter, which includes certain plant and animal pests and diseases listed in Schedule 2 of the Act. Any dealing with prohibited matter throughout New South Wales is an offence. An additional biosecurity duty applies to some people who become aware of prohibited matter, including those in charge of premises on which the prohibited matter occurs, as well as consultants who become aware of prohibited matter during the provision of professional services. Those people also have a duty to notify the Department of Primary Industries of any biosecurity event. Additional details of affected people can be found in Divisions 3 and 4 of Part 2 of the Act.

Adopting hygiene into fieldwork routines is a way that people can manage their biosecurity risks and meet their general biosecurity duty under the Biosecurity Act.

Appendix B: NSW species that are susceptible to *Phytophthora cinnamomi*

Phytophthora cinnamomi (Phytophthora) is as a threat to several threatened species and ecological communities. Further surveys and species-susceptibility testing is required to identify additional species and ecological communities that are susceptible to Phytophthora in New South Wales. The research is ongoing and, therefore, the list below is likely to be incomplete. Staff should check the best available and most recent information on any species or ecological community of interest.

Table 8 NSW plant species that are susceptible (or suspected to be susceptible) to *Phytophthora cinnamomi*

NSW conservation status in parentheses: Protected (P), Vulnerable (V), Endangered (E), Critically endangered (CE), Extinct (Ex).

Species	Reference(s)	Species	Reference(s)
Acacia buxifolia subsp. *buxifolia*	NSW TSSC (2011)	*Angophora costata*	NSW TSSC (2011)
Acacia genistifolia	NSW TSSC (2011)	*Aotus ericoides*	Podger et al. (1990); Schahinger et al. (2003); Weste (2001)
Acacia siculiformis	NSW TSSC (2011)	*Astroloma humifusum*	NSW TSSC (2011)
Actinotus helianthin (P)	Fraser (1956)	*Banksia cunninghamii*	Weste (2001); McDougall and Summerell (2003b)
Acrotriche serrulata	NSW TSSC (2011)	*Banksia ericifolia*	NSW TSSC (2011)
Allocasuarina rigida	NSW TSSC (2011)	*Banksia marginata*	Pratt and Heather (1973); Podger et al. (1990); Lee and Wicks (1977); Vickery (1997); Schahinger et al. (2003); Weste (2001)
Allocasuarina verticillata	NSW TSSC (2011)	*Banksia serrata*	Pratt and Heather (1973); Podger et al. (1990); Schahinger et al. (2003); Weste (2001)
Amperea xiphoclada (Ex)	NSW TSSC (2011)	*Banksia spinulosa* var. *cunninghamii* (P)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Bauera rubioides	Podger and Brown (1989); Podger et al. (1990); Schahinger et al. (2003); Weste (2001)	*Daviesia mimosoides*	NSW TSSC (2011)
Boronia anemonifolia (P)	NSW TSSC (2011)	*Daviesia wyattiana*	McDougall and Summerell (2003b)
Boronia deanei (V)	NSW TSSC (2011)	*Dianella longifolia sens. lat.*	NSW TSSC (2011)
Bossiaea cinerea	Podger et al. (1990); Schahinger et al. (2003); Weste (2001)	*Dillwynia cinerascens*	Weste (2001)
Bossiaea obcordata	NSW TSSC (2011)	*Dillwynia glaberrima*	Podger et al. (1990); Weste (2001); Schahinger et al. (2003)
Bossiaea prostrata	Weste (2001)	*Dillwynia phylicoides*	NSW TSSC (2011)
Brachyloma daphnoides	Weste (2001)	*Dillwynia sericea*	NSW TSSC (2011)
Callitris preissii	NSW TSSC (2011)	*Dillwynia tenuifolia* (V)	NSW TSSC (2011)
Calytrix tetragona	Podger et al. (1990); Weste (2001); Schahinger et al. (2003)	*Diplarrena moraea*	NSW TSSC (2011)
Cassinia aculeata	NSW TSSC (2011)	*Dodonaea boroniifolia*	NSW TSSC (2011)
Conospermum taxifolium	NSW TSSC (2011)	*Dodonaea viscosa*	NSW TSSC (2011)
Correa reflexa	Podger et al. (1990); Weste (2001)	*Epacris hamiltonii* (E)	NSW TSSC (2011)
Crowea exalata (P)	NSW TSSC (2011)	*Epacris impressa*	Weste (2001)
Crowea saligna (P)	NSW TSSC (2011)	*Epacris paludosa*	NSW TSSC (2011)
Darwinia biflora (V)	NSW TSSC (2011)	*Epacris purpurascens* (V)	Fraser (1956)
Darwinia peduncularis (V)	NSW TSSC (2011)	*Epacris sparsa* (V)	NSW TSSC (2011)
Daviesia leptophylla	Weste (2001)	*Eriostemon myoporoides* (P)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Eucalyptus baxteri	NSW TSSC (2011)	*Grevillea irrasa* subsp. *irrasa*	McDougall and Summerell (2003b) (NSW TSSC (2011))
Eucalyptus camfieldii (V)	NSW TSSC (2011)	*Grevillea juniperina sens. lat.*	NSW TSSC (2011)
Eucalyptus imlayensis (CE)	NSW TSSC (2011)	*Grevillea lanigera*	NSW TSSC (2011)
Eucalyptus macrorhyncha	NSW TSSC (2011)	*Grevillea linsmithii*	NSW TSSC (2011)
Eucalyptus niphophila	NSW TSSC (2011)	*Grevillea molyneuxii* (V)	NSW TSSC (2011)
Eucalyptus obliqua	NSW TSSC (2011)	*Grevillea mucronulata*	NSW TSSC (2011)
Eucalyptus polyanthemos	NSW TSSC (2011)	*Grevillea oleoides*	McDougall and Summerell (2003b)
Eucryphia moorei	NSW TSSC (2011)	*Grevillea parviflora* subsp. *parviflora* (V)	NSW TSSC (2011)
Exocarpus cupressiformis	NSW TSSC (2011)	*Grevillea parviflora* subsp. *supplicans* (E)	NSW TSSC (2011)
Genoplesium rhyoliticum (E)	NSW TSSC (2011)	*Grevillea polybractea*	NSW TSSC (2011)
Goodenia hederacea subsp. *hederacea*	Weste (2001)	*Grevillea rivularis* (CE)	NSW TSSC (2011)
Goodenia humilis	Weste (2001)	*Grevillea rosmarinifolia*	NSW TSSC (2011)
Grevillea acanthifolia subsp. *paludosa* (E)	NSW TSSC (2011)	*Grevillea victoriae sens. lat.*	NSW TSSC (2011)
Grevillea acanthifolia subsp. *stenomera*	NSW TSSC (2011)	*Grevillea wilkinsonii* (E)	NSW TSSC (2011)
Grevillea alpina	NSW TSSC (2011)	*Hakea bakeriana*	NSW TSSC (2011)
Grevillea caleyi (CE)	NSW TSSC (2011)	*Hakea ulicina*	NSW TSSC (2011)
Grevillea granulifera	NSW TSSC (2011)	*Hakea dohertyi* (E)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Haloragodendron monospermum	NSW TSSC (2011)	*Leionema lachnaeoides* (E)	NSW TSSC (2011)
Helichrysum collinum	NSW TSSC (2011)	*Leionema ralstonii* (V)	NSW TSSC (2011)
Hibbertia calycina	NSW TSSC (2011)	*Leptospermum coriaceum*	NSW TSSC (2011)
Hibbertia circinate (CE)	Wan et al. (in prep.)	*Leptospermum juniperinum*	Lee and Wicks (1977); Vickery (1997); McDougall and Summerell (2003b)
Hibbertia cistiflora	Weste (2001)	*Leptospermum lanigerum* (P)	NSW TSSC (2011)
Hibbertia fasciculata	Weste et al. (2002)	*Leucopogon collinus*	NSW TSSC (2011)
Hibbertia marginata (V)	NSW TSSC (2011)	*Leucopogon confertus*	NSW TSSC (2011)
Hibbertia obtusifolia	NSW TSSC (2011)	*Leucopogon ericoides*	Podger et al. (1990); Weste (2001); Schahinger et al. (2003)
Hibbertia procumbens (E)	NSW TSSC (2011)	*Leucopogon esquamatus*	NSW TSSC (2011)
Hibbertia villosa	NSW TSSC (2011)	*Leucopogon exolasius*	NSW TSSC (2011)
Hibbertia virgata	NSW TSSC (2011)	*Leucopogon fletcheri* subsp. *fletcheri* (E)	NSW TSSC (2011)
Hovea linearis	Weste (2001)	*Leucopogon lanceolatus*	NSW TSSC (2011)
Isopogon fletcheri (V)	NSW TSSC (2011)	*Leucopogon maccraei*	NSW TSSC (2011)
Isopogon petiolaris (P)	NSW TSSC (2011)	*Leucopogon microphyllus* var. *pilibundus*	NSW TSSC (2011)
Kennedia prostrata	NSW TSSC (2011)	*Leucopogon virgatus*	Taylor (1974); Lee and Wicks (1977); Podger et al. (1990); Weste (2001)
Kunzea ambigua	NSW TSSC (2011)	*Lissanthe strigose*	Weste (2001)
Lasiopetalum joyceae (V)	NSW TSSC (2011)	*Lomatia fraseri*	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Macrozamia communis	Pratt and Heather (1973); McDougall and Summerell (2003b)	*Persoonia glaucescens* (E)	NSW TSSC (2011)
Macrozamia johnsonii (E)	NSW TSSC (2011)	*Persoonia hindii* (E)	NSW TSSC (2011)
Melaleuca biconvexa (V)	NSW TSSC (2011)	*Persoonia hirsuta* (E)	NSW TSSC (2011)
Melaleuca squamea	NSW TSSC (2011)	*Persoonia juniperina* (P)	Weste (2001)
Melaleuca uncinate	NSW TSSC (2011)	*Persoonia marginata* (V)	NSW TSSC (2011)
Melichrus urceolatus	NSW TSSC (2011)	*Persoonia mollis* subsp. *maxima* (E)	NSW TSSC (2011)
Monotoca elliptica	Podger et al. (1990); McDougall and Summerell (2003b); Schahinger et al. (2003)	*Persoonia nutans* (E)	NSW TSSC (2011)
Monotoca scoparia	Taylor (1974); Weste (2001)	*Persoonia pauciflora* (CE)	NSW TSSC (2011)
Nematolepis rhytidophylla (V)	Wan et al. (accepted)	*Persoonia sylvatica* (P)	McDougall and Summerell (2003b)
Oxylobium ellipticum	Podger et al. (1990); McDougall and Summerell (2003a)	*Petrophile pulchella* (P)	NSW TSSC (2011)
Ozothamnus obcordatus subsp. *major*	NSW TSSC (2011)	*Phebalium phylicifolium*	NSW TSSC (2011)
Patersonia sericea	NSW TSSC (2011)	*Phebalium squamulosum* spp. *alpinum* (P)	Rigg et al. (2018)
Persoonia acerosa (V)	NSW TSSC (2011)	*Philotheca myoporoides* (P)	Taylor (1974)
Persoonia bargoensis (E)	NSW TSSC (2011)	*Phyllanthus hirtellus*	NSW TSSC (2011)
Persoonia cornifolia (P)	McDougall and Summerell (2003b)	*Phyllota humifusa* (V)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Pimelea linifolia subsp. *linifolia*	Weste (2001); Weste et al. (2002)	*Prostanthera ringens*	NSW TSSC (2011)
Podocarpus lawrencei	NSW TSSC (2011)	*Prostanthera saxicola* var. *montana*	NSW TSSC (2011)
Pomaderris delicata (CE)	Wan et al. (in prep.)	*Pultenaea altissima*	NSW TSSC (2011)
Pomaderris intermedia	NSW TSSC (2011)	*Pultenaea aristata* (V)	NSW TSSC (2011)
Prostanthera askania (E)	NSW TSSC (2011)	*Pultenaea baeuerlenii* (V)	NSW TSSC (2011)
Prostanthera cineolifera (V)	NSW TSSC (2011)	*Pultenaea benthamii*	McDougall and Summerell (2003b)
Prostanthera cryptandroides (V)	NSW TSSC (2011)	*Pultenaea daphnoides*	Pratt and Heather (1973); Podger et al. (1990); McDougall and Summerell (2003b); Schahinger et al. (2003)
Prostanthera cuneata	NSW TSSC (2011)	*Pultenaea flexilis*	NSW TSSC (2011)
Prostanthera decussata	Weste (2001)	*Pultenaea glabra* (V)	NSW TSSC (2011)
Prostanthera densa (V)	NSW TSSC (2011)	*Pultenaea humilis* (V)	NSW TSSC (2011)
Prostanthera discolour (V)	NSW TSSC (2011)	*Pultenaea mollis*	Barker and Wardlaw (1995); Weste (2001)
Prostanthera junonis	NSW TSSC (2011)	*Pultenaea parrisiae*	Wan et al. (in prep.)
Prostanthera lasianthos	NSW TSSC (2011)	*Pultenaea parrisiae* subsp. *elusa* (V)	NSW TSSC (2011)
Prostanthera marifolia (CE)	Wan et al. (accepted); NSW TSSC (2011)	*Pultenaea parrisiae* subsp. *parrisiae* (V)	NSW TSSC (2011)
Prostanthera ovalifolia	NSW TSSC (2011)	*Pultenaea parviflora* (E)	NSW TSSC (2011)
Prostanthera palustris (V)	NSW TSSC (2011)	*Pultenaea pedunculata* (E)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Pultenaea procumbens	NSW TSSC (2011)	*Tetratheca glandulosa* (V)	NSW TSSC (2011)
Pultenaea pycnocephala	NSW TSSC (2011)	*Tetratheca juncea* (V)	NSW TSSC (2011)
Pultenaea sp. Genowlan Point (CE)	Wan et al. (accepted)	*Tetratheca pilosa* (Ex)	Podger et al. (1990); Weste (2001)
Pultenaea subcapitata	NSW TSSC (2011)	*Tetratheca subaphylla*	McDougall and Summerell (2003b)
Pultenaea villifera var. *villifera*	NSW TSSC (2011)	*Triplarina nowraensis* (E)	NSW TSSC (2011)
Rulingia prostrata	NSW TSSC (2011)	*Westringia davidii* (V)	NSW TSSC (2011)
Sprengelia incarnata (P)	Podger and Brown (1989); McDougall and Summerell (2003b); McDougall et al. (2018)	*Westringia kydrensis* (E)	NSW TSSC (2011)
Stylidium graminifolium	NSW TSSC (2011)	*Wollemia nobilis* (CE)	Bullock et al. (2000)
Styphelia adscendens	Weste (2001); Schahinger et al. (2003)	*Woollsia pungens*	Fraser (1956)
Styphelia perileuca (V)	NSW TSSC (2011)	*Xanthorrhoea australis* (P)	Weste (2001); McDougall and Summerell (2003b)
Tasmannia glaucifolia (V)	NSW TSSC (2011)	*Xanthorrhoea glauca* subsp. *glauca* (P)	McDougall and Summerell (2003b)
Tasmannia lanceolata	NSW TSSC (2011)	*Xanthorrhoea resinifera* (P)	Weste (2001); McDougall and Summerell (2003b)
Tasmannia purpurascens (V)	McDougall and Summerell (2003a)	*Xanthosia dissecta*	Weste (2001); Weste et al. (2002)
Telopea mongaensis (P)	NSW TSSC (2011)	*Xanthosia tridentata*	Fraser (1956)
Telopea speciosissima (P)	Taylor (1974)	*Zieria adenophora* (CE)	NSW TSSC (2011)
Tetratheca ciliata	Weste (2001); Schahinger et al. (2003)	*Zieria baeuerlenii* (E)	NSW TSSC (2011)

Species	Reference(s)	Species	Reference(s)
Zieria buxijugum (CE)	NSW TSSC (2011)	*Zieria murphyi* (V)	NSW TSSC (2011)
Zieria covenyi (E)	NSW TSSC (2011)	*Zieria parrisiae* (CE)	NSW TSSC (2011)
Zieria formosa (CE)	NSW TSSC (2011)	*Zieria prostrata* (E)	NSW TSSC (2011)
Zieria laevigata	NSW TSSC (2011)	*Zieria tuberculate* (V)	NSW TSSC (2011)
Zieria lasiocaulis (E)	NSW TSSC (2011)		

Appendix C: NSW species that are susceptible to myrtle rust (*Austropuccinia psidii*)

Myrtle rust affects plants in the Myrtaceae family. There are over 300 native species known to be susceptible to myrtle rust (Makinson 2018b). The Myrtaceae family is ecologically important in Australia, accounting for about 10% of Australia's native flora, with many Australian plant communities primarily comprised of myrtaceous species. Consequently, there are also many species of native fauna, which depend on the Myrtaceae family, that are also indirectly threatened by the impacts of myrtle rust.

Table 9 NSW endemic species susceptible to myrtle rust (Makinson 2018b; Soewarto et al. 2019)
NSW conservation status in parentheses: Protected (P), Vulnerable (V), Endangered (E), Critically endangered (CE), Extinct (Ex).

Species	Species	Species
Angophora costata subsp. uncertain	*Backhousia subargentea* (Synonym: *Choricarpia subargentea*)	*Callistemon salignus* (Synonym*: Melaleuca salicina*)
Angophora floribunda	*Baeckea gunniana*	*Callistemon sieberi (*Synonym*: Melaleuca paludicola)*
Angophora subvelutina	*Baeckea linifolia* (P)	*Callistemon* sp. 'Rock of Gibraltar' (LM Copeland 3618)
Archirhodomyrtus beckleri [southern chemotype]	*Callistemon citrinus* (Synonym: *Melaleuca citrina*)	*Callistemon viminalis* (Synonym*: Melaleuca viminalis*)
Austromyrtus dulcis	*Callistemon linearifolius* (Synonym: *Melaleuca linearifolia*) (V)	*Calytrix tetragona*
Austromyrtus tenuifolia	*Callistemon linearis* (Synonym: *Callistemon rigidus*)	*Corymbia citriodora* subsp*. citriodora* and subsp. uncertain
Backhousia leptopetala (Synonym: *Choricarpia leptopetala*)	*Callistemon pachyphyllus* (Synonym: *Melaleuca pachyphylla*)	*Corymbia citriodora* subsp*. variegata*
Backhousia myrtifolia	*Callistemon pallidus* (Synonym: *Melaleuca pallida*)	*Corymbia gummifera*
Backhousia sciadophora	*Callistemon pinifolius* (Synonym*: Melaleuca linearis* var*. pinifolia*)	*Corymbia henryi*

Species	Species	Species
Corymbia intermedia	*Eucalyptus cinerea*	*Eucalyptus microcorys*
Corymbia maculata	*Eucalyptus crebra*	*Eucalyptus moluccana*
Corymbia tessellaris	*Eucalyptus dalrympleana* subsp. *dalrympleana*	*Eucalyptus nitens*
Corymbia variegata [= *citriodora*] x *C. torelliana*	*Eucalyptus deanei* (Synonym: *Eucalyptus brunnea*)	*Eucalyptus obliqua*
Darwinia glaucophylla (V)	*Eucalyptus delegatensis*	*Eucalyptus olida*
Darwinia procera	*Eucalyptus dunnii*	*Eucalyptus ovata* var. *ovata*
Decaspermum humile [Southern metapopulation]	*Eucalyptus elata*	*Eucalyptus pauciflora* subsp. *pauciflora*
Eucalyptus agglomerata	*Eucalyptus fastigata*	*Eucalyptus perriniana*
Eucalyptus baileyana	*Eucalyptus gillii*	*Eucalyptus pilularis*
Eucalyptus baueriana subsp. *baueriana*	*Eucalyptus globoidea*	*Eucalyptus planchoniana*
Eucalyptus burgessiana	*Eucalyptus globulus* subsp. *bicostata* (Synonym: *Eucalyptus bicostata*)	*Eucalyptus populnea* subsp. uncertain
Eucalyptus camaldulensis subsp. uncertain	*Eucalyptus globulus* subsp. *Globulus* (Synonym: *Eucalyptus globulus* [*sens. strict.*])	*Eucalyptus punctata* (Synonym: *Eucalyptus biturbinata*)
Eucalyptus camfieldii (V)	*Eucalyptus globulus* subsp. uncertain	*Eucalyptus radiata* subsp. *radiata*
Eucalyptus campanulata (Synonym: *E. andrewsii* subsp. *campanulata*)	*Eucalyptus goniocalyx* subsp. uncertain	*Eucalyptus resinifera* [subsp. uncertain]
Eucalyptus camphora subsp. uncertain	*Eucalyptus grandis*	*Eucalyptus resinifera* subsp. *hemilampra*
Eucalyptus carnea	*Eucalyptus haemastoma*	*Eucalyptus robusta*
Eucalyptus cephalocarpa	*Eucalyptus laevopinea*	*Eucalyptus rubida* subsp. *rubida*

Species	Species	Species
Eucalyptus saligna	*Lenwebbia prominens*	*Leptospermum trinervium*
Eucalyptus siderophloia	*Lenwebbia* sp. Main Range (P.R.Sharpe+ 4877) (CE)	*Leptospermum whitei*
Eucalyptus sieberi	*Leptospermum brachyandrum*	*Lophostemon suaveolens*
Eucalyptus smithii	*Leptospermum continentale* 'cv. Horizontalis'	*Melaleuca alternifolia*
Eucalyptus tereticornis subsp. uncertain	*Leptospermum deuense*	*Melaleuca armillaris* [subsp. uncertain]
Eucalyptus tindaliae	*Leptospermum juniperinum*	*Melaleuca biconvexa* (V)
Eucalyptus viminalis [*sens. str.;* = subsp. *viminalis*]	*Leptospermum laevigatum*	*Melaleuca comboynensis*
Gossia acmenoides	*Leptospermum lanigerum* (P)	*Melaleuca decora*
Gossia bidwillii	*Leptospermum liversidgei*	*Melaleuca howeana*
Gossia floribunda	*Leptospermum luehmannii*	*Melaleuca linariifolia*
Gossia fragrantissima (E)	*Leptospermum morrisonii* 'cv. Burgundy'	*Melaleuca nodosa*
Gossia hillii	*Leptospermum myrsinoides*	*Melaleuca quinquenervia*
Gossia punctata	*Leptospermum petersonii*	*Melaleuca sieberi*
Homoranthus flavescens	*Leptospermum polygalifolium* [subsp. uncertain]	*Melaleuca squamea*
Homoranthus melanostictus	*Leptospermum polygalifolium* x *L. scoparium*	*Melaleuca squarrosa*
Homoranthus prolixus (V)	*Leptospermum rotundifolium* (P)	*Melaleuca styphelioides*
Homoranthus virgatus	*Leptospermum scoparium*	*Metrosideros nervulosa*
Homorathus croftianus (E)	*Leptospermum scoparium* x *L. macrocarpum*	*Metrosideros sclerocarpa*
Kunzea baxteri	*Leptospermum semibaccatum*	*Pilidiostigma glabrum*
Kunzea ericoides	*Leptospermum spectabile* (P)	*Rhodamnia argentea*

Species	Species	Species
Rhodamnia maideniana	*Syzygium francisii*	*Syzygium oleosum*
Rhodamnia rubescens (CE)	*Syzygium fullagarii*	*Syzygium smithii* (Synonym: *Acmena smithii*)
Rhodomyrtus psidioides (CE)	*Syzygium hemilamprum* [subsp. uncertain] (Synonym: *Acmena hemilampra*)	*Syzygium wilsonii* x *luehmannii* (Synonym: *S. luehmannii* x *wilsonii*)
Syncarpia glomulifera subsp. uncertain	*Syzygium hodgkinsoniae* (V)	*Tristania neriifolia*
Syzygium anisatum (Synonym: *Backhousia anisata*, *Anetholea anisata*)	*Syzygium ingens* (Synonym: *Acmena ingens*)	*Tristaniopsis collina*
Syzygium australe	*Syzygium luehmannii*	*Tristaniopsis laurina*
Syzygium corynanthum	*Syzygium moorei* (V)	*Uromyrtus lamingtonensis*
Syzygium floribundum (Synonym: *Waterhousea floribunda*)		

Appendix D: Invasive non-native terrestrial plants that are prohibited matter under the *Biosecurity Act 2015*

The *Biosecurity Act 2015* identifies prohibited matter in Schedule 2. Any person who deals with prohibited matter is guilty of an offence under that Act.

The definition of dealing includes moving, releasing, propagating, experimenting with, disposing, acquiring and possessing plants or animals that are listed prohibited matter.

Table 10 Invasive non-native terrestrial plants that are prohibited matter

Scientific name	Common name	Related BC Act KTP
Andropogon gayanus	Gamba grass	Invasion of native plant communities by exotic perennial grasses
Annona glabra	Pond apple	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Asparagus declinatus	Bridal veil creeper	Invasion and establishment of exotic vines and scramblers
Bassia scoparia (excluding subsp. *trichophylla*)	Kochia	
Centaurea stoebe subsp. *micranthos*	Spotted knapweed	
Centaurea x moncktonii	Black knapweed	
Chromolaena odorata	Siam weed	
Clidemia hirta	Koster's curse	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Cryptostegia grandiflora	Rubber vine	Invasion and establishment of exotic vines and scramblers
Hieracium (all species except *H. murorum*) and *Pilosella* spp. (all species)	Hawkweed	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Miconia spp. (all species)	Miconia	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Mikania micrantha	Mikania vine	Invasion and establishment of exotic vines and scramblers
Mimosa pigra	Mimosa	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Nassella tenuissima (syn. *Stipa tenuissima*)	Mexican feather grass	Invasion of native plant communities by exotic perennial grasses

Scientific name	Common name	Related BC Act KTP
Orobanche spp. (all species except the native *O. cernua* var. *australiana* and *O. minor*)	Broomrape	
Parthenium hysterophorus	Parthenium weed	
Striga spp. (except the native *S. parviflora*)	Witchweed	
Vachellia karroo (syn. *Acacia karroo*)	Karoo acacia	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Vachellia nilotica (syn. *Acacia nilotica*)	Prickly acacia	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Appendix E: Additional considerations for amphibian chytrid fungus

Captive frog hygiene management

Frogs and tadpoles should only be removed from a site when absolutely necessary. When holding frogs in captivity, it is important to maintain a high level of hygiene because turnover of frogs in a facility can lead to potentially high risk of amphibian chytrid transmission.

The risks of transmitting amphibian chytrid among captive frogs can be reduced by:

- keeping frogs collected from different sites separate from each other
- reducing the amount of water, equipment or filtration systems shared between tanks or aquaria that are housing frogs
- cleaning, disinfecting and drying tanks and aquaria immediately after removing frogs.

When removal of a frog from the wild is essential (e.g. for research purposes), you should keep frogs from different sites separate (as above) while you monitor for signs of illness or disease. If signs of illness or disease are detected, seek advice from a veterinarian to determine the nature of the problem.

If a frog (or frogs) is infected with chytrid, seek advice from a licensed veterinarian. Common treatments including anti-fungal agents such as *Itraconazole*© can be used to treat chytrid infection. Carefully controlled, ramping heat treatment can be an effective chytrid treatment or prevention strategy in some frog species, but this method can be lethal to native species that cannot withstand high temperatures. This approach should only be considered by experienced laboratories and only with authorisation from a relevant animal ethics committee.

If tadpoles have been bred or held in captivity, they should not be released into the wild. If considering a release of captive tadpoles, you should contact the National Parks and Wildlife Service wildlife team at wildlife.licensing@environment.nsw.gov.au (or 02 9585 6406) to determine your licensing requirements. Pathological testing should be undertaken prior to any release, to reduce the likelihood of releasing individuals infected with amphibian chytrid fungus.

Displaced frogs

Frogs may be inadvertently transported long distances in fruit and vegetable shipments and landscape supplies (this commonly occurs to *Litoria gracilenta*, *L. bicolor* and *L. caerulea*). These frogs pose a risk for the spread of disease and it is rarely feasible to return them to their place of origin with any accuracy.

If you encounter a displaced frog, you should contact a local wildlife carer organisation to collect the animal. The frog should be monitored for signs of infection.

Frogs found on or around roads, dwellings, gardens or swimming pools should not be considered displaced.

Sick and dead frogs

Symptoms

Frogs infected with amphibian chytrid fungus may exhibit a range of physical and/or behavioural symptoms, including:

- discoloured skin
- swollen hind limbs
- emaciation

- skin lesions, increased sloughing (shedding of skin)
- showing little or no response to physical stimuli
- being lethargic or having no appetite.

What to do with sick or dead frogs

Unless part of a licensed research project, sick or dead frogs encountered in the wild should not be touched, collected or moved due to risks of spreading disease.

If collection of a sick or dead frog is part of a licensed research project, you should first (i.e. before you encounter a sick or dead frog) establish what you intend to do with it. This may include preserving it at your own research institute for testing or sending it to a research institute for testing.

When handling sick or dead frogs, wear a new pair of disposable gloves for handling each frog, use a clean plastic bag for transporting each frog (for live frogs, ensure the bag is not airtight) and keep the frog cool during transport.

If the frog is dead, you should preserve it as soon as possible. A frog can be preserved in 10 times its own volume of preservative (70% ethanol or 10% buffered formalin). The frog's belly should be cut open prior to preservation to maximise preservation of internal organs. Alternatively, frogs can be frozen, although freezing can make tissues unsuitable for some laboratory tests.

Euthanasia

If the frog is sick and unlikely to survive, it should be euthanased using an acceptable method. The American Veterinary Medical Association's Guidelines for the Euthanasia of Animals (PDF 11.8MB) (AVMA 2020) prescribes a number of acceptable euthanasia methods, including using injectable and topical agents. These methods should only be undertaken by a licensed veterinarian.

Where other methods are not available, the generally-accepted method of euthanasia is blunt force trauma to the head, followed by decapitation or pithing to ensure quick death. This should only be applied by trained and skilled people (AMVA 2020). Gradually cooling the animal in the refrigerator prior to applying blunt force trauma may reduce the risk of causing suffering.

Euthanasia of frogs associated with animal research must only be done in accordance with an animal research authority.

Appendix F: Template for a hygiene management plan

Team/region/area/park/project	Identify the team, region, area or park to which the hygiene management plan applies. If the plan applies to a specific project (e.g. construction works, conservation project, etc.) specify it here.
Background and infestation status	Provide relevant background information. Consider including: • infestation status (known, suspected, unknown) for pathogens of interest, or past occurrences • presence of susceptible species or ecological communities • the type of work generally being undertaken (earthworks, general maintenance, conservation projects, etc.). If the plan is for a specific project and/or species, specify why hygiene management is an important component.
Objective(s)	What are your specific objectives as they relate to your team, region or area? This could include: • restricting the entry of pathogens to certain locations • restricting exit of pathogens from infested locations in the area • prioritising specific sites or locations for protection • determining the extent of pathogen distribution.
Mapping and risk assessment	Do you propose to undertake any mapping exercises to determine the extent of pathogen distribution? Mapping can help to refine the objectives. What are the risks related to movement of the pathogen(s) throughout, into or out of the area? What are the potential consequences?
Hygiene measures	How will you apply the hygiene measures outlined in the hygiene guidelines? This should relate directly to your objectives and risks identified above and refer to both vehicle and personnel hygiene. For example, if the objective is to restrict pathogen entry to a specific site, strict hygiene measures could be applied at the border of the site prior to entry. Are there any circumstances or sites where additional hygiene measures might be required? Consider developing a tailored decision tree or simply identifying the sites or areas that are prioritised for strict hygiene. How (if at all) will you address hygiene risks posed by the general public? For example, through installation of boot-cleaning stations. Consider boot-cleaning station design and location.
Protecting vegetation	Will you consider any proactive treatments to protect susceptible plants from infection? If so, consider undertaking a risk assessment to help you prioritise areas (or species) for treatment.

Prescriptions for external parties undertaking work on-park	Will you place any prescriptions on external parties undertaking work on-park? Work may include (but should not be limited to) contractors undertaking maintenance or earthworks, research or bush regeneration. If the prescriptions are different from the 'Hygiene measures' above, explain why. These should be included in contracts or agreements when engaging third parties to undertake work on your behalf.
Education and communication	How will you inform people about this hygiene management plan (or appropriate hygiene practices generally)? Consider relevant audiences, including internal staff, contractors and the general public. Examples include signage, pamphlets, information on a website, etc.

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