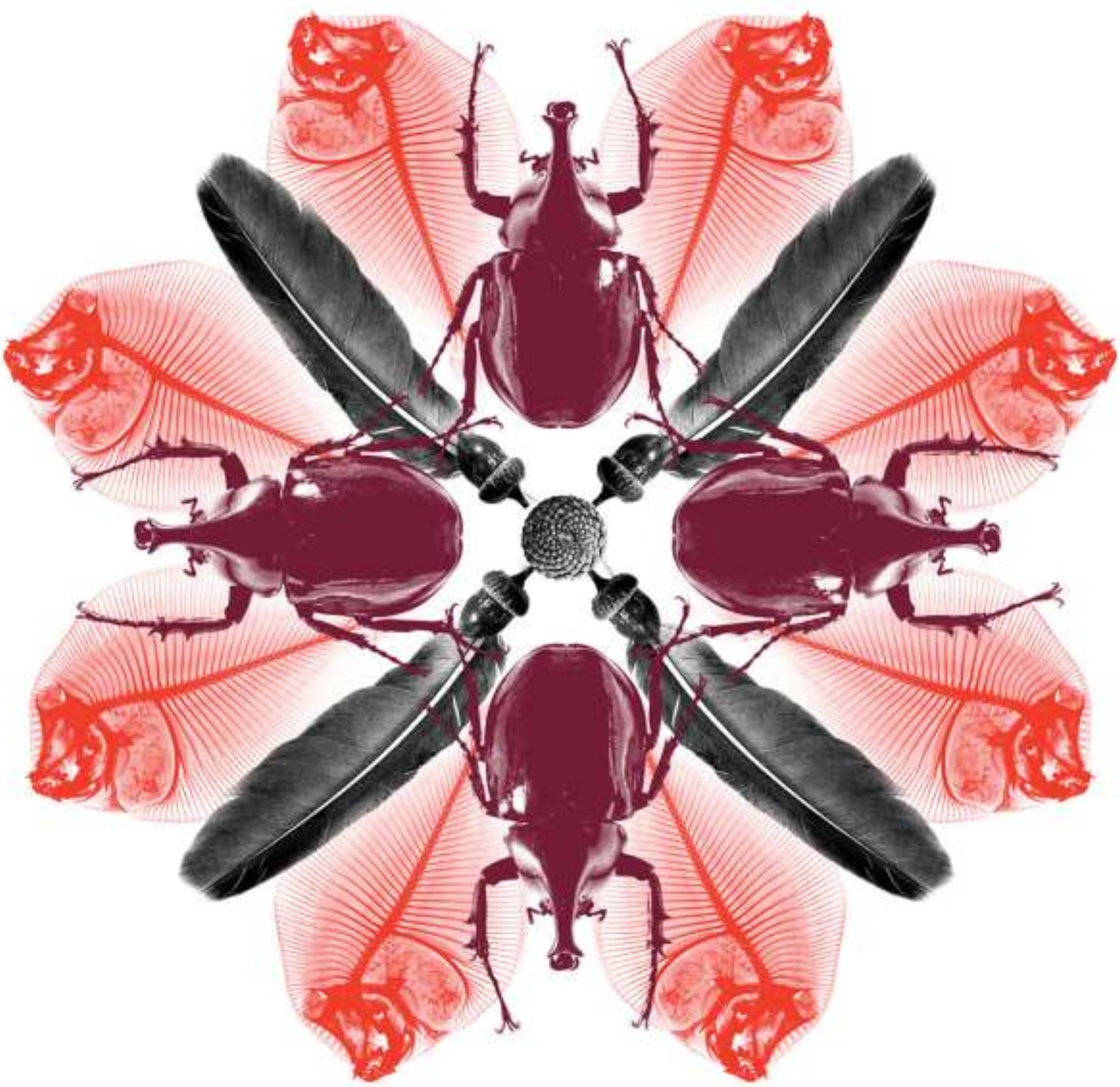
Australian Government
Department of Agriculture

Final report for the non-regulated analysis of existing policy for table grapes from Japan

December 2014



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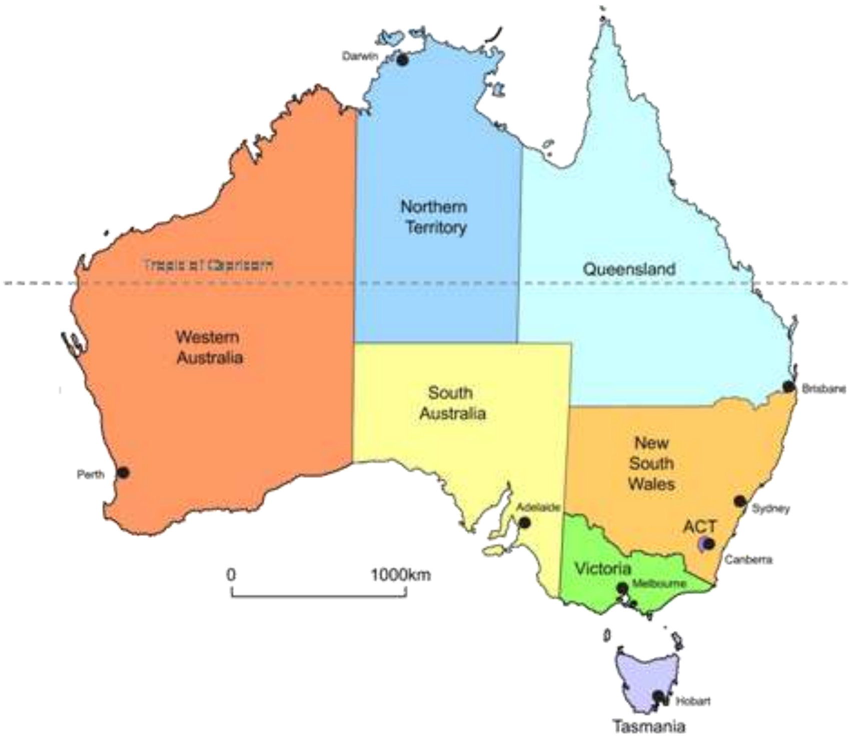


Figure 2 A guide to Australia's bio-climatic zones

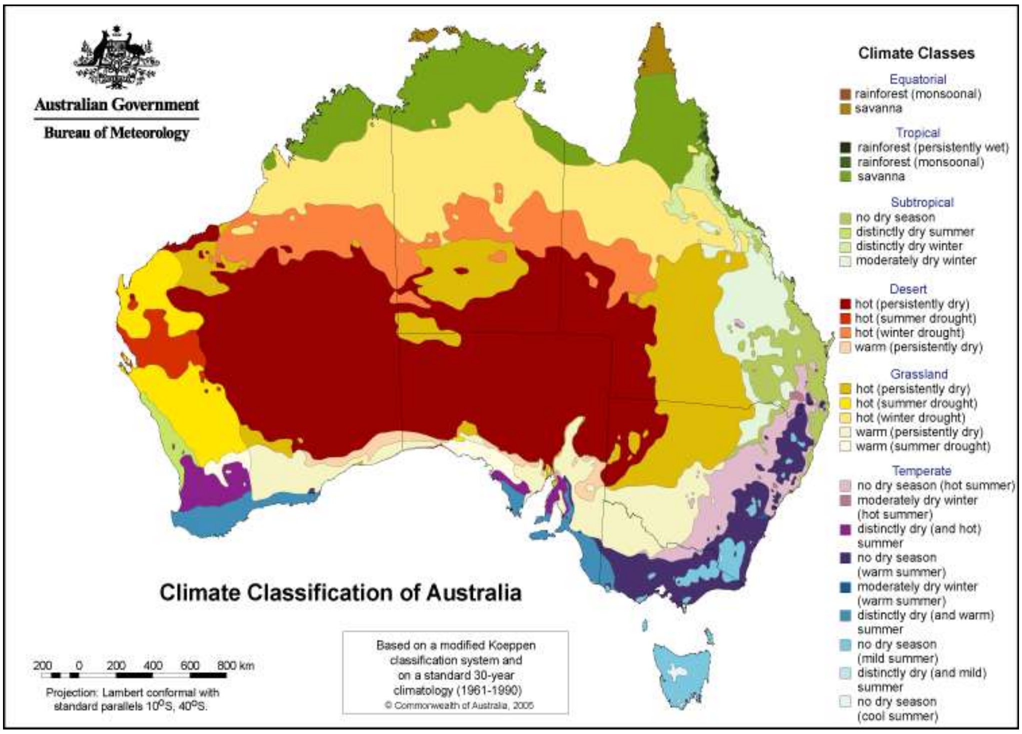
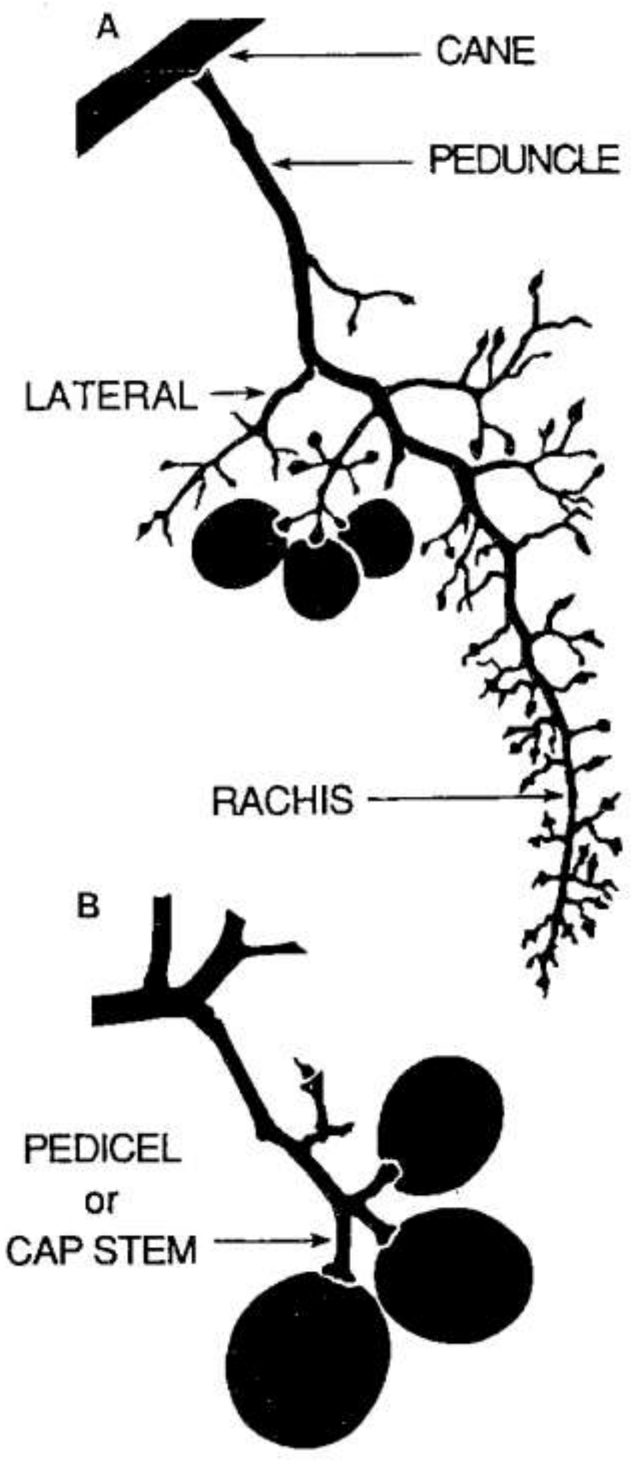


Figure 3 Diagram of table grape bunch or cluster

A shows the main parts of a grape cluster, **B** shows detail of the berry attachment

Note: Some authors use the term fruit stem without defining if they refer to pedicel, rachis, peduncle or all of these parts; and some use the term peduncle to refer to pedicel.



Source: (Pratt 1988)

Acronyms and abbreviations

Term or abbreviation	Definition
ACT	Australian Capital Territory
ALOP	Appropriate level of protection
BA	Biosecurity Advice
CABI	CAB International, Wallingford, UK
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Acronym of the former Australian Government Department of Agriculture, Fisheries and Forestry, which is now Department of Agriculture
DAFWA	Department of Agriculture and Food of Western Australia
EP	Existing policy
EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organization of the United Nations
JA Group	Japan Agriculture Cooperatives Group—a national organisation of farmers established in accordance with Japan's Agricultural Cooperative Society Law
IPC	International Phytosanitary Certificate
IPPC	International Plant Protection Convention
IRA	Import Risk Analysis
ISPM	International Standard for Phytosanitary Measures
MAFF	Japan's Ministry of Agriculture, Forestry and Fisheries
NSW	New South Wales
NPPO	National Plant Protection Organisation
NT	Northern Territory
OIE	World Organisation for Animal Health
PIRSA	Department of Primary Industries and Regions of South Australia
PRA	Pest risk analysis
Qld	Queensland
SA	South Australia
SPS	Sanitary and Phytosanitary
Tas.	Tasmania
US	The United States of America
Vic.	Victoria
WA	Western Australia
WTO	World Trade Organization

Summary

The Australian Government Department of Agriculture has prepared this final report to assess the proposal by Japan for market access to Australia for fresh table grapes.

Australia has existing policy for the import of table grapes for human consumption from Chile, the United States of America (California), New Zealand, the People's Republic of China and the Republic of Korea.

This report recommends that the importation of table grapes into Australia from Japan meets Australia's biosecurity requirements subject to a range of risk management measures, together with a system of operational procedures.

This final report identifies pests that require phytosanitary measures to manage risks to a very low level in order to achieve Australia's appropriate level of protection (ALOP). Nineteen pests were identified as requiring phytosanitary measures. Out of these 19 pests, 14 are arthropods and five are pathogens.

The fourteen arthropod pests requiring measures are: *Harmonia axyridis* (Harlequin ladybird), *Popillia japonica* (Japanese beetle), *Aleurolobus taonabae* (grape whitefly), *Crisicoccus matsumotoi* (Matsumoto mealybug), *Planococcus kraunhiae* (Japanese mealybug), *Planococcus lilacinus* (coffee mealybug), *Pseudococcus comstocki* (Comstock's mealybug), *Eupoecilia ambiguella* (grape berry moth), *Sparganothis pilleriana* (grapevine leaf roller), *Tetranychus kanzawai* (Kanzawa spider mite), *Drepanothrips reuteri* (grape thrips), *Frankliniella occidentalis* (western flower thrips), *Drosophila suzukii* (spotted wing drosophila) and *Daktulosphaira vitifoliae* (grapevine phylloxera).

The five pathogen pests requiring measures are: *Guignardia bidwellii* (black rot), *Physalospora baccae* (grape cluster black rot), *Monilinia fructigena* (brown rot), *Monilia polystroma* (Asiatic brown rot) and *Phakopsora euvitis* (grape rust fungus).

The recommended phytosanitary measures take account of regional differences within Australia. One arthropod pest requiring measures has been identified as a quarantine pest for Western Australia and one for the Northern Territory.

This final report recommends a range of risk management measures, combined with a system of operational procedures to ensure quarantine standards are met. These measures will reduce the risk posed by the 19 quarantine pests, and achieve Australia's ALOP. These measures include:

- phytosanitary inspection and remedial action for the ladybird, beetle, whitefly, mealybugs, leafrollers, spider mite and thrips
- area freedom, a systems approach or fruit treatment known to be effective in managing all life stages of spotted wing drosophila
- area freedom or fruit treatment known to be effective in managing grapevine phylloxera
- area freedom or a systems approach for the management of black rot, grape cluster black rot, Asiatic brown rot, brown rot and grape rust fungus
- a supporting operational system to maintain and verify the phytosanitary status of export consignments.

The Department of Agriculture has made a number of changes to the risk analysis following consideration of stakeholder comments on the draft report and subsequent review of literature. These changes include:

- additional information under chapter 4 to provide clarity around why the probability of distribution from the previous assessments for table grapes from other countries were adopted for table grapes from Japan
- additional text under chapter 5 to provide clarity around remedial action
- additional option for fruit treatment using a combined SO_2/CO_2 fumigation followed by cold disinfestion treatment to manage *Drosophila suzukii* as a result of efficacy data provided by a trading partner
- minor corrections, rewording and editorial changes for consistency, clarity and web-accessibility.

1 Introduction

1.1 Australia's biosecurity policy framework

Australia's biosecurity policies aim to protect Australia against the risks that may arise from exotic pests entering, establishing and spreading in Australia, thereby threatening Australia's unique flora and fauna, as well as those agricultural industries that are relatively free from serious pests.

The risk analysis process is an important part of Australia's biosecurity policies. It enables the Australian Government to formally consider the risks that could be associated with proposals to import new products into Australia. If the risks are found to exceed Australia's appropriate level of protection (ALOP), risk management measures are proposed to reduce the risks to an acceptable level. But, if it is not possible to reduce the risks to an acceptable level, then no trade will be allowed.

Successive Australian Governments have maintained a conservative, but not a zero-risk, approach to the management of biosecurity risks. This approach is expressed in terms of Australia's ALOP, which reflects community expectations through government policy and is currently described as providing a high level of protection aimed at reducing risk to a very low level, but not to zero.

Australia's risk analyses are undertaken by the Department of Agriculture using technical and scientific experts in relevant fields, and involve consultation with stakeholders at various stages during the process.

The Department of Agriculture's assessment may take the form of an import risk analysis (IRA), a non-regulated analysis of existing policy, or technical advice.

Further information about Australia's biosecurity framework is provided in Appendix C of this report and in the *Import Risk Analysis Handbook 2011* located on the Department of Agriculture website.

1.2 This non-regulated analysis of existing policy

1.2.1 Background

The Japan Ministry of Agriculture, Forestry and Fisheries (MAFF) formally requested market access to Australia for fresh table grapes, among other commodities, in 1988.

In August 2012, MAFF advised that access for table grapes was its top priority. On 1 May 2013, the Department of Agriculture formally announced the commencement of this import risk analysis, advising that it would be progressed as a non-regulated analysis of existing policy.

1.2.2 Scope

The scope of this risk analysis is to consider the quarantine risk that may be associated with the importation of commercially produced fresh table grapes (*Vitis vinifera* and hybrids) (henceforth these will be referred to as table grapes) from Japan, for human consumption in Australia.

In this risk analysis, table grapes is defined as table grape bunches or clusters, which include peduncles, rachises, laterals, pedicels and berries (Pratt 1988), but not other plant parts (see Figure 3). This risk analysis covers all commercially produced table grapes from all table grape producing prefectures of Japan.

1.2.3 Existing policy

International policy

Import policies exist for table grapes imported from the United States of America (California) (AQIS 1999a; AQIS 2000; Biosecurity Australia 2006; DAFF 2013), Chile (Biosecurity Australia 2005), New Zealand (Department of Agriculture 2013), China (Biosecurity Australia 2011a), and Korea (Biosecurity Australia 2011b).

The import requirements for these commodity pathways can be found at the Department of Agriculture website.

Domestic arrangements

The Commonwealth Government is responsible for regulating the movement of plants and plant products into and out of Australia. However, the state and territory governments are responsible for plant health controls within their individual jurisdictions. Legislation relating to resource management or plant health may be used by state and territory government agencies to control interstate movement of plants and their products. Once plant and plant products have been cleared by Australian biosecurity officers, they may be subject to interstate movement conditions. It is the importer’s responsibility to identify, and ensure compliance with all requirements.

Under Western Australian legislation, grape fruit, seeds and plants and machinery used in the growing or processing of grapes are prescribed potential carriers of various declared pests and are restricted entry into Western Australia. Import permits may be issued for the entry of grape plants and propagative material subject to post entry quarantine requirements.

On 15 September 2011, the Government Department of Agriculture and Food, Western Australia (DAFWA) announced the formal commencement of a pest risk analysis considering the importation of fresh table grapes into Western Australia from other Australian states and territories. That process is still underway.

1.2.4 Contaminating pests

In addition to the pests associated with fresh table grapes from Japan that are assessed in this risk analysis, there are other organisms that may arrive with the imported commodity. These organisms could include pests of other crops or predators and parasitoids of other arthropods. The Department of Agriculture considers these organisms to be contaminating pests that could pose sanitary and phytosanitary risks. These risks are addressed by existing operational procedures that require a 600 unit inspection of all consignments and investigation of any pest that may be of quarantine concern to Australia.

The risk of contaminating weed seeds is also addressed by the procedures detailed in section 5.4.

1.2.5 Consultation

On 1 May 2013, the Australian Department of Agriculture notified stakeholders in Biosecurity Advice 2013/11 of the formal commencement of a non-regulated analysis of existing policy to consider a proposal from Japan for market access to Australia for fresh table grapes.

The department provided a draft pest categorisation to Australian state and territory government departments on 5 August 2013 for their advance consideration of regional pests, prior to the formal release of the draft report.

The department has regularly consulted with Japan's MAFF and Australian state and territory government departments during the preparation of the draft report and then released the draft report for a 60 day stakeholder comment period on 30 January 2014. The department received four submissions on the draft report. All submissions were carefully considered and, where relevant, changes were made to the final report.

2 Method for pest risk analysis

This chapter sets out the method used for the pest risk analysis (PRA) in this report. The Department of Agriculture has conducted this PRA in accordance with the International Standards for Phytosanitary Measures (ISPMs), including ISPM 2: *Framework for pest risk analysis* (FAO 2007b) and ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2013) that have been developed under the SPS Agreement (WTO 1995).

A PRA is 'the process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it' (FAO 2012). A pest is 'any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products' (FAO 2012).

Quarantine risk consists of two major components: the probability of a pest entering, establishing and spreading in Australia from imports; and the consequences should this happen. These two components are combined to give an overall estimate of the risk.

Unrestricted risk is estimated taking into account the existing commercial production practices of the exporting country and that, on arrival in Australia, the Department of Agriculture will verify that the consignment received is as described on the commercial documents and its integrity has been maintained.

Restricted risk is estimated with phytosanitary measure(s) applied. A phytosanitary measure is 'any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests' (FAO 2012).

A glossary of the terms used is provided at the back of this report.

The PRAs are conducted in the following three consecutive stages: initiation, pest risk assessment and pest risk management.

2.1 Stage 1 Initiation

Initiation identifies the pest(s) and pathway(s) that are of quarantine concern and should be considered for risk analysis in relation to the identified PRA area.

The initiation point for this risk analysis was the receipt of a technical submission from MAFF for access to the Australian market for fresh table grapes.

Appendix A of this risk analysis report lists the pests with the potential to be associated with the exported commodity produced using commercial production and packing procedures. Appendix A does not present a comprehensive list of all the pests associated with the entire plant, but concentrates on the pests that could be on the assessed commodity. Contaminating pests that have no specific relation to the commodity or the export pathway have not been listed and would be addressed by Australia's current approach to contaminating pests.

The identity of the pests is given in Appendix A. The species name is used in most instances but a lower taxonomic level is used where appropriate. Synonyms are provided where the current scientific name differs from that provided by Japan's Ministry of Agriculture, Forestry and Fisheries or where the cited literature used a different scientific name.

For this risk analysis, the 'PRA area' is defined as Australia for pests that are absent, or of limited distribution and under official control. For areas with regional freedom from a pest, the 'PRA area' may be defined on the basis of a state or territory of Australia or may be defined as a region of Australia consisting of parts of a state or territory or several states or territories.

For pests that had been considered by the Department of Agriculture in other risk assessments and for which import policies already exist, a judgement based on the specific circumstances was made on the likelihood of entry of pests on the commodity and whether existing policy is adequate to manage the risks associated with its import. Where appropriate, the previous risk assessment was taken into consideration when developing the new policy.

2.2 Stage 2 Pest risk assessment

A pest risk assessment (for quarantine pests) is the 'evaluation of the probability of the introduction and spread of a pest and of the magnitude of the associated potential economic consequences' (FAO 2012).

In this risk analysis, pest risk assessment was divided into the following interrelated processes:

2.2.1 Pest categorisation

Pest categorisation identifies which of the pests with the potential to be on the commodity are quarantine pests for Australia and require pest risk assessment. A 'quarantine pest' is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled, as defined in ISPM 5: *Glossary of phytosanitary terms* (FAO 2012).

The pests identified in Stage 1 were categorised using the following primary elements to identify the quarantine pests for the commodity being assessed:

- identity of the pest
- presence or absence in the PRA area
- regulatory status
- potential for establishment and spread in the PRA area
- potential for economic consequences (including environmental consequences) in the PRA area.

Initiation and categorisation steps are presented in Appendix A. The quarantine pests identified were carried forward for pest risk assessment and are listed in Table 4.1.

2.2.2 Assessment of the probability of entry, establishment and spread

Details of how to assess the 'probability of entry', 'probability of establishment' and 'probability of spread' of a pest are given in ISPM 11 (FAO 2013). A summary of this process is given below, followed by a description of the qualitative methodology used in this risk analysis.

Probability of entry

The probability of entry describes the probability that a quarantine pest will enter Australia as a result of trade in a given commodity, be distributed in a viable state in the PRA area and subsequently be transferred to a host. It is based on pathway scenarios depicting necessary steps in the sourcing of the commodity for export, its processing, transport and storage, its use in Australia and the generation and disposal of waste. In particular, the ability of the pest to survive is considered for each of these various stages.

The probability of entry estimates for the quarantine pests for a commodity are based on the use of the existing commercial production, packaging and shipping practices of the exporting country. Details of the existing commercial production practices for the commodity are set out in Chapter 3. These practices are taken into consideration by the Department of Agriculture when estimating the probability of entry.

For the purpose of considering the probability of entry, the department divides this step into two components:

- **Probability of importation**—the probability that a pest will arrive in Australia when a given commodity is imported.
- **Probability of distribution**—the probability that the pest will be distributed, as a result of the processing, sale or disposal of the commodity, in the PRA area and subsequently transfer to a susceptible part of a host.

Factors considered in the probability of importation include:

- distribution and incidence of the pest in the source area
- occurrence of the pest in a life-stage that would be associated with the commodity
- mode of trade (for example bulk, packed)
- volume and frequency of movement of the commodity along each pathway
- seasonal timing of imports
- pest management, cultural and commercial procedures applied at the place of origin
- speed of transport and conditions of storage compared with the duration of the lifecycle of the pest
- vulnerability of the life-stages of the pest during transport or storage
- incidence of the pest likely to be associated with a consignment
- commercial procedures (for example refrigeration) applied to consignments during transport and storage in the country of origin, and during transport to Australia.

Factors considered in the probability of distribution include:

- commercial procedures (for example refrigeration) applied to consignments during distribution in Australia
- dispersal mechanisms of the pest, including vectors, to allow movement from the pathway to a host
- whether the imported commodity is to be sent to a few or many destination points in the PRA area

- proximity of entry, transit and destination points to hosts
- time of year at which import takes place
- intended use of the commodity (for example for planting, processing or consumption)
- risks from by-products and waste.

Probability of establishment

Establishment is defined as the ‘perpetuation for the foreseeable future, of a pest within an area after entry’ (FAO 2012). In order to estimate the probability of establishment of a pest, reliable biological information (for example lifecycle, host range, epidemiology, survival) is obtained from the areas where the pest currently occurs. The situation in the PRA area can then be compared with that in the areas where it currently occurs and expert judgement used to assess the probability of establishment.

Factors considered in the probability of establishment in the PRA area include:

- availability of hosts, alternative hosts and vectors
- suitability of the environment
- reproductive strategy and potential for adaptation
- minimum population needed for establishment
- cultural practices and control measures.

Probability of spread

Spread is defined as ‘the expansion of the geographical distribution of a pest within an area’ (FAO 2012). The probability of spread considers the factors relevant to the movement of the pest, after establishment on a host plant or plants, to other susceptible host plants of the same or different species in other areas. In order to estimate the probability of spread of the pest, reliable biological information is obtained from areas where the pest currently occurs. The situation in the PRA area is then carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the probability of spread.

Factors considered in the probability of spread include:

- suitability of the natural and/or managed environment for natural spread of the pest
- presence of natural barriers
- potential for movement with commodities, conveyances or by vectors
- intended use of the commodity
- potential vectors of the pest in the PRA area
- potential natural enemies of the pest in the PRA area.

Assigning qualitative likelihoods for the probability of entry, establishment and spread

In its qualitative PRAs, the Department of Agriculture uses the term ‘likelihood’ for the descriptors it uses for its estimates of probability of entry, establishment and spread. Qualitative likelihoods are assigned to each step of entry, establishment and spread. Six descriptors are used: high; moderate; low; very low; extremely low; and negligible (Table 2.1). Descriptive definitions for these descriptors and their indicative probability ranges are given in Table 2.1. The indicative probability ranges are only provided to illustrate the boundaries of the descriptors and are not used beyond this purpose in qualitative PRAs. These indicative probability ranges provide guidance to the risk analyst and promote consistency between different pest risk assessments.

Table 2.1 Nomenclature for qualitative likelihoods

Likelihood	Descriptive definition	Indicative probability (P) range
High	The event would be very likely to occur	$0.7 < P \leq 1$
Moderate	The event would occur with an even probability	$0.3 < P \leq 0.7$
Low	The event would be unlikely to occur	$0.05 < P \leq 0.3$
Very low	The event would be very unlikely to occur	$0.001 < P \leq 0.05$
Extremely low	The event would be extremely unlikely to occur	$0.000001 < P \leq 0.001$
Negligible	The event would almost certainly not occur	$0 < P \leq 0.000001$

The likelihood of entry is determined by combining the likelihood that the pest will be imported into the PRA area and the likelihood that the pest will be distributed within the PRA area, using a matrix of rules (Table 2.2). This matrix is then used to combine the likelihood of entry and the likelihood of establishment, and the likelihood of entry and establishment is then combined with the likelihood of spread to determine the overall likelihood of entry, establishment and spread.

For example, if the probability of importation is assigned a likelihood of ‘low’ and the probability of distribution is assigned a likelihood of ‘moderate’, then they are combined to give a likelihood of ‘low’ for the probability of entry. The likelihood for the probability of entry is then combined with the likelihood assigned to the probability of establishment (for example ‘high’) to give a likelihood for the probability of entry and establishment of ‘low’. The likelihood for the probability of entry and establishment is then combined with the likelihood assigned to the probability of spread (for example ‘very low’) to give the overall likelihood for the probability of entry, establishment and spread of ‘very low’. A working example is provided below;

P [importation] x *P* [distribution] = *P* [**entry**] **low x moderate = low**

P [entry] x *P* [establishment] = *P* [**EE**] **low x high = low**

P [**EE**] x [spread] = ***P* [EES]** **low x very low = very low**

Table 2.2 Matrix of rules for combining qualitative likelihoods

	High	**Moderate**	**Low**	**Very low**	**Extremely low**	**Negligible**
High	High	Moderate	Low	Very low	Extremely low	Negligible
Moderate		Low	Low	Very low	Extremely low	Negligible
Low			Very low	Very low	Extremely low	Negligible
Very low				Extremely low	Extremely low	Negligible
Extremely low					Negligible	Negligible
Negligible						Negligible

Time and volume of trade

One factor affecting the likelihood of entry is the volume and duration of trade. If all other conditions remain the same, the overall likelihood of entry will increase as time passes and the overall volume of trade increases.

The Department of Agriculture normally considers the likelihood of entry on the basis of the estimated volume of one year's trade. This is a convenient value for the analysis that is relatively easy to estimate and allows for expert consideration of seasonal variations in pest presence, incidence and behaviour to be taken into account. The consideration of the likelihood of entry, establishment and spread and subsequent consequences takes into account events that might happen over a number of years even though only one year's volume of trade is being considered. This difference reflects biological and ecological facts, for example where a pest or disease may establish in the year of import but spread may take many years.

The use of a one year volume of trade has been taken into account when setting up the matrix that is used to estimate the risk and therefore any policy based on this analysis does not simply apply to one year of trade. Policy decisions that are based on the Department of Agriculture's method that uses the estimated volume of one year's trade are consistent with Australia's policy on appropriate level of protection and meet the Australian Government's requirement for ongoing quarantine protection. Of course if there are substantial changes in the volume and nature of the trade in specific commodities then the department has an obligation to review the risk analysis and, if necessary, provide updated policy advice.

In assessing the volume of trade in this risk analysis, the department assumed that a very small volume of trade will occur (refer to section 3.6 Export Capability).

2.2.3 Assessment of potential consequences

The objective of the consequence assessment is to provide a structured and transparent analysis of the likely consequences if the pests or disease agents were to enter, establish and spread in Australia. The assessment considers direct and indirect pest effects and their economic and environmental consequences. The requirements for assessing potential consequences are given in Article 5.3 of the SPS Agreement (WTO 1995), ISPM 5 (FAO 2012) and ISPM 11 (FAO 2013).

Direct pest effects are considered in the context of the effects on:

- plant life or health
- other aspects of the environment.

Indirect pest effects are considered in the context of the effects on:

- eradication, control
- domestic trade
- international trade
- environment.

For each of these six criteria, the consequences were estimated over four geographic levels, defined as:

Local: an aggregate of households or enterprises (a rural community, a town or a local government area).

District: a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as 'Far North Queensland').

Regional: a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia).

National: Australia wide (Australian mainland states and territories and Tasmania).

For each criterion, the magnitude of the potential consequence at each of these levels was described using four categories, defined as:

Indiscernible: pest impact unlikely to be noticeable.

Minor significance: expected to lead to a minor increase in mortality/morbidity of hosts or a minor decrease in production but not expected to threaten the economic viability of production. Expected to decrease the value of non-commercial criteria but not threaten the criterion's intrinsic value. Effects would generally be reversible.

Significant: expected to threaten the economic viability of production through a moderate increase in mortality/morbidity of hosts, or a moderate decrease in production. Expected to significantly diminish or threaten the intrinsic value of non-commercial criteria. Effects may not be reversible.

Major significance: expected to threaten the economic viability through a large increase in mortality/morbidity of hosts, or a large decrease in production. Expected to severely or irreversibly damage the intrinsic 'value' of non-commercial criteria.

The estimates of the magnitude of the potential consequences over the four geographic levels were translated into a qualitative impact score (A–G) using table 2.3. For example, a consequence with a magnitude of 'significant' at the 'district' level will have a consequence impact score of D.

Table 2.3 Decision rules for determining the consequence impact score based on the magnitude of consequences at four geographic scales

		Geographic scale			
		Local	District	Region	Nation
Magnitude	Indiscernible	A	A	A	A
	Minor significance	B	C	D	E
	Significant	C	D	E	F
	Major significance	D	E	F	G

Note: In earlier qualitative IRAs, the scale for the impact scores went from A to F and did not explicitly allow for the rating 'indiscernible' at all four levels. This combination might be applicable for some criteria. In this report, the impact scale of A-F has changed to become B-G and a new lowest category A ('indiscernible' at all four levels) was added. The rules for combining impacts in Table 2.4 were adjusted accordingly.

The overall consequence for each pest is achieved by combining the qualitative impact scores (A–G) for each direct and indirect consequence using a series of decision rules (Table 2.4). These rules are mutually exclusive, and are assessed in numerical order until one applies.

Table 2.4 Decision rules for determining the overall consequence rating for each pest

Rule	The impact scores for consequences of direct and indirect criteria	Overall consequence rating
1	Any criterion has an impact of ‘G’; or more than one criterion has an impact of ‘F’; or a single criterion has an impact of ‘F’ and each remaining criterion an ‘E’.	Extreme
2	A single criterion has an impact of ‘F’; or all criteria have an impact of ‘E’.	High
3	One or more criteria have an impact of ‘E’; or all criteria have an impact of ‘D’.	Moderate
4	One or more criteria have an impact of ‘D’; or all criteria have an impact of ‘C’.	Low
5	One or more criteria have an impact of ‘C’; or all criteria have an impact of ‘B’.	Very Low
6	One or more but not all criteria have an impact of ‘B’, and all remaining criteria have an impact of ‘A’.	Negligible

2.2.4 Estimation of the unrestricted risk

Once the above assessments are completed, the unrestricted risk can be determined for each pest or groups of pests. This is determined by using a risk estimation matrix (Table 2.5) to combine the estimates of the probability of entry, establishment and spread and the overall consequences of pest establishment and spread. Therefore, risk is the product of likelihood and consequence.

When interpreting the risk estimation matrix, note the descriptors for each axis are similar (for example low, moderate, high) but the vertical axis refers to likelihood and the horizontal axis refers to consequences. Accordingly, a ‘low’ likelihood combined with ‘high’ consequences, is not the same as a ‘high’ likelihood combined with ‘low’ consequences—the matrix is not symmetrical. For example, the former combination would give an unrestricted risk rating of ‘moderate’, whereas, the latter would be rated as a ‘low’ unrestricted risk.

Table 2.5 Risk estimation matrix

Likelihood of pest entry, establishment and spread						
High	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Low	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
Very low	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
Extremely low	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk
Negligible	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk
	Negligible	**Very low**	**Low**	**Moderate**	**High**	**Extreme**
	Consequences of pest entry, establishment and spread					

2.2.5 Australia’s appropriate level of protection (ALOP)

The SPS Agreement defines the concept of an ‘appropriate level of sanitary or phytosanitary protection (ALOP)’ as the level of protection deemed appropriate by the WTO Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.

Like many other countries, Australia expresses its ALOP in qualitative terms. Australia's ALOP, which reflects community expectations through government policy, is currently expressed as providing a high level of sanitary or phytosanitary protection aimed at reducing risk to a very low level, but not to zero. The band of cells in Table 2.5 marked 'very low risk' represents Australia's ALOP.

2.3 Stage 3 Pest risk management

Pest risk management describes the process of identifying and implementing phytosanitary measures to manage risks to achieve Australia's ALOP, while ensuring that any negative effects on trade are minimised.

The conclusions from pest risk assessment are used to decide whether risk management is required and if so, the appropriate measures to be used. Where the unrestricted risk estimate exceeds Australia's ALOP, risk management measures are required to reduce this risk to a very low level. The guiding principle for risk management is to manage risk to achieve Australia's ALOP. The effectiveness of any proposed phytosanitary measures (or combination of measures) is evaluated, using the same approach as used to evaluate the unrestricted risk, to ensure it reduces the restricted risk for the relevant pest or pests to meet Australia's ALOP.

ISPM 11 (FAO 2013) provides details on the identification and selection of appropriate risk management options and notes that the choice of measures should be based on their effectiveness in reducing the probability of entry of the pest.

Examples given of measures commonly applied to traded commodities include:

- options for consignments—for example, inspection or testing for freedom from pests, prohibition of parts of the host, a pre-entry or post-entry quarantine system, specified conditions on preparation of the consignment, specified treatment of the consignment, restrictions on end-use, distribution and periods of entry of the commodity
- options preventing or reducing infestation in the crop—for example, treatment of the crop, restriction on the composition of a consignment so it is composed of plants belonging to resistant or less susceptible species, harvesting of plants at a certain age or specified time of the year, production in a certification scheme
- options ensuring that the area, place or site of production or crop is free from the pest—for example, pest-free area, pest-free place of production or pest-free production site
- options for other types of pathways—for example, consider natural spread, measures for human travellers and their baggage, cleaning or disinfestations of contaminated machinery
- options within the importing country—for example, surveillance and eradication programs
- prohibition of commodities—if no satisfactory measure can be found.

Risk management measures are identified for each quarantine pest where the risk exceeds Australia's ALOP. These are presented in Chapter 5: Pest risk management, of this report.

3 Japan's commercial production practices for table grapes

This chapter provides information on the pre-harvest, harvest and post-harvest practices in Japan for the production of fresh table grapes for export. The export capability of Japan is also outlined.

3.1 Assumptions used in estimating unrestricted risk

Production and processing procedures described in this chapter are considered to be standard commercial production practices for table grapes in the different prefectures/regions and for all the commercially produced table grape cultivars in Japan, unless otherwise indicated. Officers from the Department of Agriculture visited table grape production areas in Yamanshi Prefecture in October 2012 and in Nagano Prefecture in October 2013, to observe and verify commercial production practices related to pest management in vineyards and packinghouses.

In estimating the likelihood of pest introduction it was assumed that the pre-harvest, harvest and post-harvest production practices for table grapes, as described in this chapter, are implemented for all areas and for all grape cultivars within the scope of this analysis. Where a specific practice described in this chapter is not taken into account to estimate the unrestricted risk, it is clearly identified and explained in Chapter 4.

3.2 Climate in production areas

Table grapes are grown in all four main islands in Japan (Morinaga 2001; MAFF 2010a). The four main islands from north to south are Hokkaido, Honshu, Shikoku and Kyushu. The main commercial table grape production regions are located in Yamanashi, Nagano and Yamagata prefectures in the northern and central parts, and Okayama and Fukuoka prefectures in the southern parts (Morinaga 2001; MAFF 2010a). A map showing main islands and all prefectures of Japan is presented in Figure 3.1.

As a whole, Japan belongs to the temperate climate zone with four distinct seasons in most parts of the country: spring (March–May), summer (June–August), autumn (September–November) and winter (December–February) (Web Japan 2013). Climate in Japan varies widely from one region to another, from cool temperate in the north to subtropical in the south. Northern Japan has warm summers with long, cold winters and heavy snowfall; central Japan has hot, humid summers and short winters; and southwestern Japan has long, hot, humid summers and mild winters (Long 1994). Climate in Japan also varies with altitude and with location whether it is on the Pacific Ocean side or on the Sea of Japan side. On the Pacific Ocean side, summers are hot with lots of rain and winters generally have clear skies. The areas on the Sea of Japan side have more rain and snow during the winter months (Web Japan 2013).

Japan is generally regarded as a rainy country with high humidity. Its average annual precipitation is almost double the world average (MLIT 2012). Japan has three periods of heavy precipitation, that is the heavy winter snowfalls in the areas on the Sea of Japan side, particularly in the north; the ‘tsuyu’ rainy season which brings continuous heavy rains to most parts of the country in June and July; and the period of typhoons that originate in the southern Pacific and bring precipitation to the country, especially the southern parts in September and October (MLIT 2012). Some of the typhoons can cause significant destruction to Japan (MLIT 2012; Web Japan 2013). Maximum precipitation occurs in the summer months, except in the areas on the Sea of Japan side where maximum precipitation occurs in winter (Long 1994).

Japan intends to export fresh table grapes to Australia from the following prefectures: Yamagata (located towards the north of Honshu Island), Yamanashi and Nagano (located around the centre of Honshu Island), Hiroshima (located in the south of Honshu Island), Kagawa (located on Shikoku Island in the southern part of Japan), and Oita (located on Kyushu Island also in the southern part of Japan) (MAFF 2013a; MAFF 2013c) (see Figure 3.1). The majority of grapes for export to Australia will be sourced from Yamanashi and Nagano (MAFF 2013a; MAFF 2013c).

Climate data sourced from Japan Meteorological Agency for the intended six exporting prefectures are presented in Figure 3.2. Among these prefectures, Nagano has the least annual precipitation. However, the average annual precipitation for Nagano is still close to 1000 millimetres. All other five prefectures have average annual precipitation above 1000 millimetres, with Hiroshima and Oita being the wettest prefectures with average annual precipitation above 1500 millimetres (Japan Meteorological Agency 2013).

Figure 3.1 Map showing prefectures of Japan

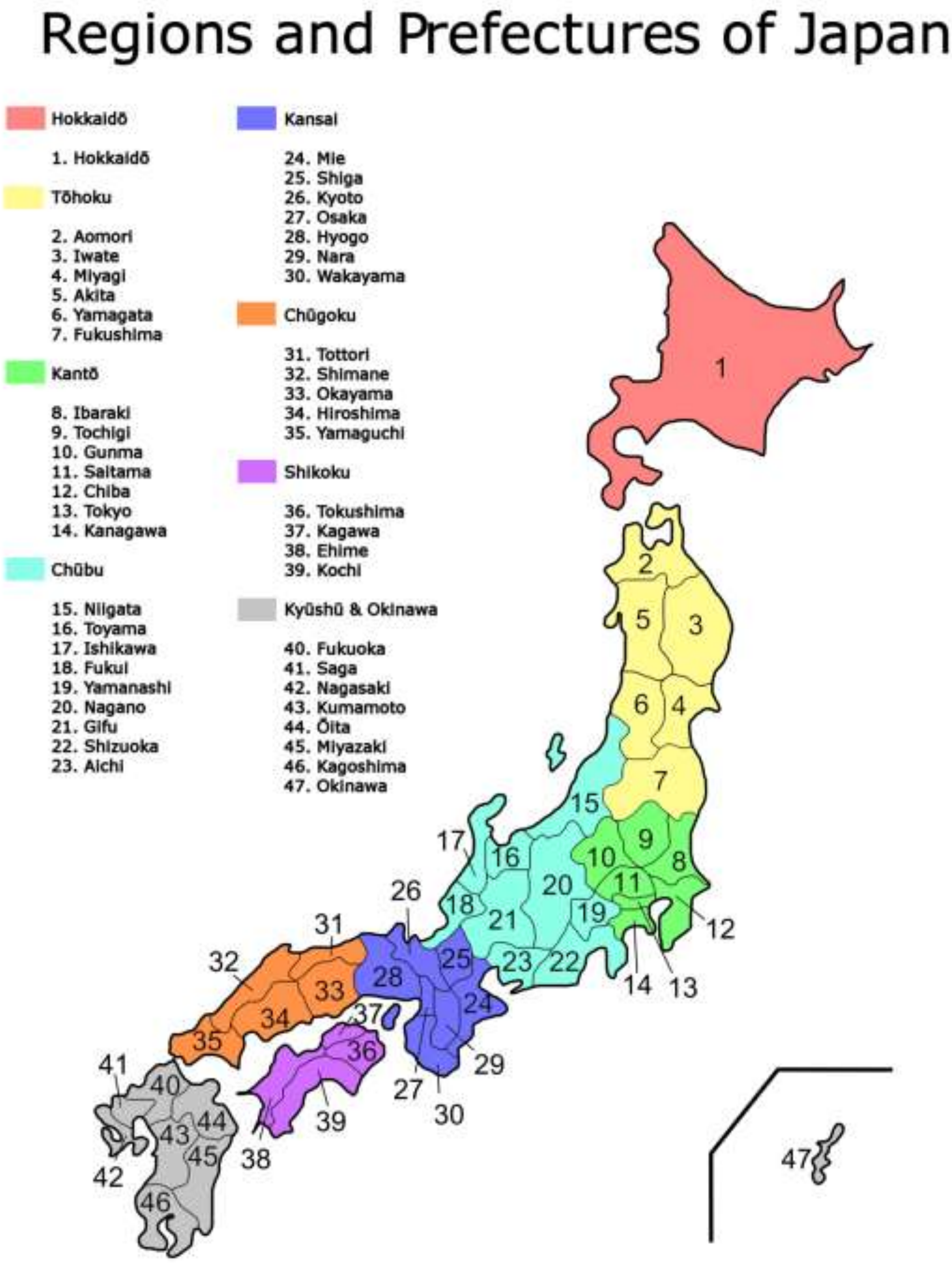
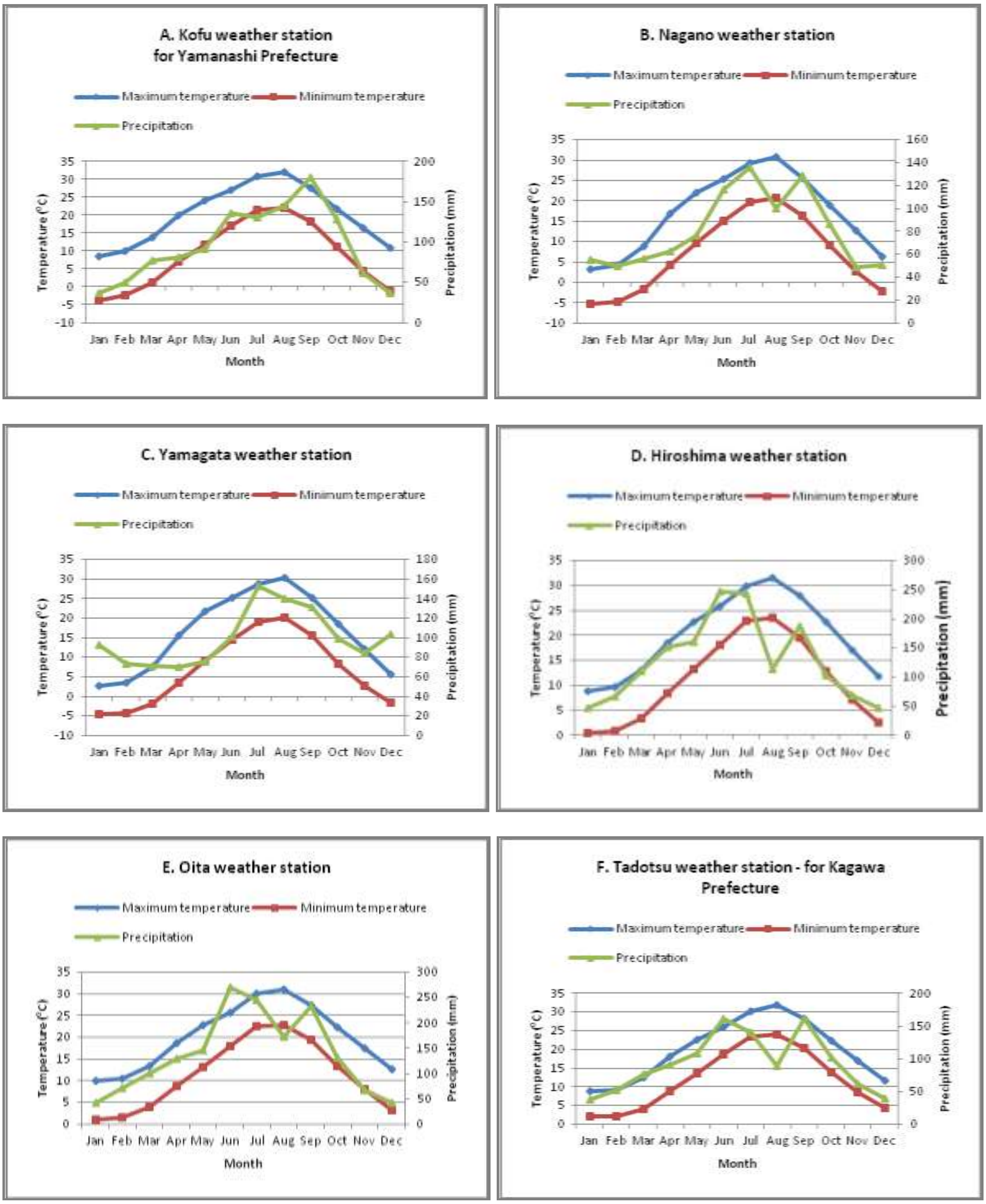


Figure 3.2 Mean maximum and minimum temperatures and mean precipitation, during 1913–2012, in the intended export prefectures, based on data sourced from the Japan Meteorological Agency



3.3 Pre-harvest

Most vineyards in Japan produce table grapes, which contribute 87.4 per cent of total grape production (Morinaga 2001). The remaining 11.0, 1.4 and 0.2 per cent are for the production of wine, juice and canned fruit, respectively (Morinaga 2001).

3.3.1 Cultivars

Several grape cultivars are grown in Japan. Grape breeding programs in Japan aim to develop grape cultivars that are well suited to Japan's environmental conditions and consumers' preferences. More than 200 grape cultivars have been developed (Morinaga 2001). Japanese table grapes usually have quite thick skin, and are therefore peeled before being eaten.

Table grape cultivars Japan intends to export to Australia include: 'Kyoho' (seeded and seedless), 'Pione' (seeded and seedless), 'Shine Muscat' (seedless), 'Rosario Bianco' (seeded and seedless), 'Kaiji' (seeded) and 'New Bailey A' (seedless) (MAFF 2013c). The cultivar 'Kyoho', developed in Japan, is a premium quality cultivar famous for its large sized berries (exceeding 15g) with strong sweetness (18–20 brix) and unique flavour (FAO 2000; Morinaga 2001; Graham 2005).

3.3.2 Cultivation practices

Planting materials

Most rootstocks are produced from cuttings, and scions of commercial cultivars are then grafted. 'Teleki', '5BB' and '5C', which have positive characteristics in terms of high berry quality, early ripening and adaptability to a wide range of soil, are major rootstock cultivars used in Japan (Morinaga 2001). Propagation of virus-free vines has also been developed using in-vitro culture technology (Morinaga 2001).

Cultivation

Cultivation systems

Both field and glasshouse/greenhouse systems are used in Japan. However, Japan does not intend to export table grapes produced under a glasshouse/greenhouse system to Australia. Plastic covers/rain shelter over the top of the vines are widely used for the field grown grapevines in Japan. Wide spacing between plants and rows is commonly used in Japan. For example, the spacing of 15m × 15m is considered common in Nagano Prefecture (MAFF 2013b).

Training and pruning

Many grape-growing areas in Japan are prone to typhoons. A horizontal trellis (Figure 3.3) is used in most vineyards in Japan because it is more effective in minimising wind damage. Under the horizontal trellis, leaves are more exposed to light and spread of diseases is minimised. In addition, canopy management, cluster trimming and berry thinning can be more easily conducted under a horizontal trellis (Morinaga 2001).

Figure 3.3 Horizontal trellis system

Two principal pruning methods, short cane pruning and long cane pruning, are used in Japan (Morinaga 2001). Short cane pruning or severe spur-pruning, where straight primary shoots are maintained and only two to three buds are left on a lateral shoot, has been mainly used in the western part of Japan (Morinaga 2001). Long cane pruning, where one year old canes that elongated in the previous year are pruned leaving several buds, is used in the eastern areas of Japan (Morinaga 2001).

Intensive berry thinning and cluster trimming are practiced to obtain the crop load levels that enhance high quality table grapes with good berry size and high sugar content (Morinaga 2001).

Use of plant growth regulators

Some plant growth regulators are used in Japan to improve grape production. For example, gibberellic acid (GA) is used to produce seedless grapes and increase berry size (Morinaga 2001). For ‘Delaware’ and ‘Muscat Bailey A’ cultivars, fruit clusters are dipped in a 100 parts per million of GA solution two weeks pre-bloom to induce seedless berries, and again post-bloom to stimulate berry enlargement (Morinaga 2001). For ‘Kyoho’ and ‘Pione’, a lower concentration of GA and a later application is used (Morinaga 2001). In Nagano, some growers apply GA at full bloom (25 parts per million) and two weeks after full bloom (25 parts per million) (Australian Department of Agriculture 2013). 6-N-benzylamino purine has been used to prevent floret dropping (Morinaga 2001). Maleic hydrazide choline has also been used in Japan to suppress excess vegetative growth of the cane (Morinaga 2001).

Irrigation

Ground sprinkler irrigation is the most common irrigation system in Japan, but drip-irrigation and misting nozzles are also used (Morinaga 2001).

Bagging

Bagging of grape bunches (Figure 3.4) is a standard practice for commercial table grape production in Japan (MAFF 2013e). A single layered paper bag with two slits at the bottom for drainage purpose is used. Bags are provided by the JA (Japan Agriculture Cooperatives)

Group within each prefecture. Grape bunches are bagged before grape berries start colouring (that is before veraison). Bags are removed after harvest (Australian Department of Agriculture 2013).

Note: The JA Group is a national organisation of farmers established in accordance with Japan's Agricultural Cooperative Society Law. The JA Group undertakes cooperative business and other activities, for the purpose of enhancing agricultural cooperations and improving the standard of living among farmers. It provides its members with five essential services: insurance, guidance, credit, marketing and purchasing, and welfare (Zenkyoren 2012).

Figure 3.4 Grape bunches covered in paper bags

3.3.3 Pest management

Each prefecture has its own spray calendars, provided by the respective JA Group, and for some prefectures the spray calendars may also vary according to grape cultivars. As examples, spray calendars used in Yamanashi and Nagano prefectures for 'Kyoho' cultivar are presented in Tables 3.1 and 3.2, respectively.

The JA Group within each prefecture provides pest recognition and management training to growers through regular seminars as well as property visits (Australian Department of Agriculture 2013; MAFF 2013e).

Table 3.1 Spray calendar for 'Kyoho' grape cultivar in Yamanashi Prefecture

Timing of spray	Pests	Pesticide
From mid-March to early April (Budswell)	Overwintering pests *Elsinoe ampelina* *Phomopsis viticola* *Glomerella cingulata* *Colletotrichum acutatum*	LIME SULPHUR BENOMYL THIOPHANATE-METHYL
From late April to early May (Bud burst (five to six leaves)	*Plasmopara viticola* *Elsinoe ampelina* *Scirtothrips dorsalis* *Arboridia apicalis*	ALUMINIUMTRIS(ETHYLPHOSPHONATE) TAU-FLUVALINATE CYAZOFAMID CARBARYL
From early May to mid-May (Bud burst (nine to ten leaves)	*Plasmopara viticola* *Elsinoe ampelina* *Pseudococcus comstocki* *Scirtothrips dorsalis* aphids *Arboridia apicalis*	CAPTAN ACETAMIPRID CYMOXANIL, FAMOXADONE CYMOXANIL, BENTHIAVALICARB-ISOPROPYL 2-T-BUTYLIMINO-3-ISOPROPYL-5-PHENYLPERH YDRO-1,3,5-THIADIAZINAM-4-ONE
From mid-May to late May (Shuck fall)	*Plasmopara viticola* *Botrytis cinerea* *Elsinoe ampelina* *Pseudococcus comstocki* *Scirtothrips dorsalis* *Frankliniella occidentalis*	MANZEB CYPRODINIL, FLUDIOXONIL CYMOXANIL, FAMOXADONE CYMOXANIL, BENTHIAVALICARB-ISOPROPYL OXPOCONAZOLE FUMARATE 2-T-BUTYLIMINO-3-ISOPROPYL-5-PHENYLPERH YDRO-1,3,5-THIADIAZINAM-4-ONE 2-T-BUTYLIMINO-3-ISOPROPYL-5-PHENYLPERH YDRO-1,3,5-THIADIAZINAM-4-ONE
From late May to early June (Shuck fall)	*Plasmopara viticola* *Botrytis cinerea* *Elsinoe ampelina* *Uncinula necator* *Glomerella cingulata* *Colletotrichum acutatum* *Pseudococcus comstocki* *Scirtothrips dorsalis* spider mite russet mite Tortrix *Nippoptilia vitis*	CYMOXANIL, FAMOXADONE CHLORFENAPYR ALUMINIUMTRIS(ETHYLPHOSPHONATE) ACEPHATE CYPRODINIL, FLUDIOXONIL THIACLOPRID ACEQUINOCYL (E)-4-CHLORO-ALPHA,ALPHA,ALPHA-TRIFLUOR O-N-(1-IMIDAZOL-1-YL-1-PROPOXYETHYLIDEN E)-O- TOLUIDINE
From early June to mid-June (Berries Pea-sized)	*Plasmopara viticola* *Elsinoe ampelina* *Uncinula necator* *Nippoptilia vitis* *Glomerella cingulata* *Colletotrichum acutatum* *Toleria romanovi*	MANZEB 1-[(6-CHLORO-3-PYRIDINYL)METHYL]-N-NITRO- 2-IMIDAZOLIDINIMINE (S)-ALPHA-CYANO-3-PHENOXYBENZYL(1R,3S)- 2,2-DIMETHYL-3-(1,2,2,1-TETRABROMOETHYL) CYCLOPROPANECARB) CARTAP
From mid-June to late June (Just after bagging)	*Plasmopara viticola* *Glomerella cingulata* *Colletotrichum acutatum* russet mite *Scirtothrips dorsalis*	COPPER SULFATE, TRIBASIC MILBECTIN 4-CHLORO-N-[[4-(1,1-DIMETHYLETHYL)PHENYL] METHYL]-3-ETHYL-1-METHYL-1H-PYRAZOLE-5- CARBOXAMIDE

From early July to mid-July	*Scirtothrips dorsalis* *Pseudococcus comstocki* *Plasmopara viticola* *Physopella ampelopsidis*	COPPER SULFATE, TRIBASIC ACETAMIPRID
From mid-July to mid-August	*Scirtothrips dorsalis* *Plasmopara viticola* *Physopella ampelopsidis* *Glomerella cingulata* *Colletotrichum acutatum* *Botrytis cinerea*	COPPER SULFATE, TRIBASIC ACETAMIPRID ACRINATHRIN
From early September to mid-September (Just after harvest)	*Plasmopara viticola* *Physopella ampelopsidis* *Xylotrechus rufilius*	COPPER SULFATE, TRIBASIC FENITROTHION
From late October to early November	*Xylotrechus rufilius*	FENITROTHION FENITROTHION, PHENTHOATE ACETAMIPRID

Table 3.2 Spray calendar for 'Kyoho' grape cultivar used in Nagano Prefecture

Timing of spray	Pests	Pesticide
Dormancy	Overwintering pests *Glomerella cingulata* *Colletotrichum acutatum* *Elsinoe ampelina* *Xylotrechus pyrrhoderus* *Nokona regalis* *Calepitrimerus vitis* *Brevipalpus lewisi*	LIME SULPHUR
Mid-April (Before budswell)	*Glomerella cingulata* *Colletotrichum acutatum* *Elsinoe ampelina* *Pseudocercospora vitis* *Phomopsis viticola* *Colomerus vitis* *Brevipalpus lewisi* Capsid bugs *Xylotrechus pyrrhoderus*	IMINOCTADINE TRIACETATE BENOMYL CHLOROTHALONIL DITHIANON MARATHION FENITROTHION PHENTHOATE
Bud burst (six to eight leaves)	*Plasmopara viticola* *Elsinoe ampelina* *Phomopsis viticola* *Paracythopeus melancholicus*	CAPTAN FOSETYL OXINE-COPPER
Just before flowering	*Botrytis cinerea* *Elsinoe ampelina* *Plasmopara viticola* *Pseudocercospora vitis* *Physopella ampelopsidis* *Phomopsis viticola* *Paracythopeus melancholicus* *Viteus vitifoliae* *Arboridia apicalis* *Endoclita excrescens* Eumolpinae	MANCOZEB IPRODIONE DIETHOFENCARB THIOPHANATE-METHYL IMINOCTADINE TRIACETATE POLYOXINS MEPANIPYRIM FENHEXAMID CYPRODINIL FLUDIOXONIL METALAXYL METALAXYL-M CHLOROTHALONIL CARBARYL METHIDATHION ACETAMIPRID FENITROTHION
Just after fallen flower （Mid-June to late June）	*Glomerella cingulata* *Colletotrichum acutatum* *Plasmopara viticola* *Botrytis cinerea* *Uncinula necator* *Physopella ampelopsidis* *Pseudocercospora vitis* *Coniella castaneicola* *Coniella fragariae* *Phomopsis viticola*	OXINE-COPPER MEPANIPYRIM FENHEXAMID CYPRODINIL FLUDIOXONIL PERMETHRIN CYFLUTHRIN TRALOMETHRIN FENPROPATHRIN ACETAMIPRID

	Scirtothrips dorsalis *Endoclita excrescens* *Nokona regalis* *Toleria romanovi* Chafers	FLUVALINATE ACRINATHRIN CYPERMETHRIN IMIDACLOPRID NITENPYRAM ACEPHATE CHLORFENAPYR THIAMETHOXAM PYRACLOSTROBIN BOSCALID CYMOXANIL BENTHIAVALICARB-ISOPROPYL DIMETHOMORPH MANDIPROPAMID FAMOXADONE CARTAP
From Late June to Early July	*Glomerella cingulata* *Colletotrichum acutatum* *Plasmopara viticola* *Physopella ampelopsidis* *Pseudocercospora vitis* *Coniella castaneicola* *Coniella fragariae* *Uncinula necator* *Scirtothrips dorsalis* *Endoclita excrescens* *Nokona regalis* *Toleria romanovi*	MANCOZEB PERMETHRIN CYFLUTHRIN TRALOMETHRIN FENPROPATHRIN FLUVALINATE ACRINATHRIN CYPERMETHRIN IMIDACLOPRID NITENPYRAM ACEPHATE CYMOXANIL CYAZOFAMID AMISULBROM BENOMYL IPRODIONE
Early July	*Glomerella cingulata* *Colletotrichum acutatum* *Plasmopara viticola* *Pseudocercospora vitis* *Physopella ampelopsidis* *Coniella castaneicola* *Coniella fragariae* *Uncinula necator* *Scirtothrips dorsalis* Scale insects *Nokona regalis* *Toleria romanovi* *Tetranychus urticae*	CAPTAN
Just after bagging (From Late July to Early August)	*Plasmopara viticola* *Pseudocercospora vitis* *Physopella ampelopsidis* *Uncinula necator* *Tetranychus urticae* *Scirtothrips dorsalis* *Toleria romanovi* Scale insects	BORDEAUX MIXTURE COPPER SULFATE, TRIBASIC COPPER HYDROXIDE TEBUFENPYRAD ETOXAZOLE PYRIDABEN BIFENAZATE CARTAP DIAZINON PROTHIOFOS
From Late August to Early October	*Plasmopara viticola* *Physopella ampelopsidis* *Pseudocercospora vitis* *Uncinula necator* *Xylotrechus pyrrhoderus*	BORDEAUX MIXTURE COPPER SULFATE, TRIBASIC COPPER HYDROXIDE FENITROTHION

After harvest	*Plasmopara viticola* *Physopella ampelopsidis* *Pseudocercospora vitis* *Uncinula necator*	BORDEAUX MIXTURE COPPER SULFATE, TRIBASIC COPPER HYDROXIDE

3.4 Harvesting and handling procedures

Harvesting

Berry sugar content, bunch appearance and skin colour are important quality characteristics for Japanese table grapes. Standard colour charts, sugar content (indicated as brix) and sugar:acid ratio are among harvest indices used (Morinaga 2001).

Under the open cultivation system, fruit harvesting generally begins in late July or early August for early cultivars, followed by mid-season cultivars in late August and October, and ending in late December for late cultivars (Morinaga 2001).

Harvesting occurs in the early morning. Grape bunches are snipped with small secateurs, keeping long bunch stems (peduncle) and with bags intact. Harvested grape bunches are placed in plastic field boxes (Figure 3.5) in a single layer only. In general, one box can accommodate about 24 bunches (about 10 kilograms). These boxes are then taken to the producer's packing shed for sorting, grading and packing (Australian Department of Agriculture 2013).

Figure 3.5 Plastic field boxes

3.5 Post-harvest

3.5.1 Sorting, grading and packing at producer packing shed

Harvested grapes are first sorted and graded at the producers' packing shed, according to the JA Group guidelines for table grape grades. Any debris and grapes with any signs of damage will be removed during sorting/grading processes.

Following sorting/grading, grapes are packed in cardboard boxes. The packaging varies depending on market's requirements. Examples of different packaging types used are shown in Figure 3.6. Standard boxes are labelled with producer's name, regional JA Group name, number of bunches per box, grape cultivar and quality grade (Figure 3.7). The packaged grapes are then transported to the packing house (Australian Department of Agriculture 2013).

Figure 3.6 Examples of different packaging types

Figure 3.7 Labelling of standard boxes

3.5.2 Packing houses

Packing houses are operated by the respective JA Group. Packing houses used for table grapes are not used for any other commodities (Australian Department of Agriculture 2013). The majority, by far, of table grapes processed in the packing houses are for domestic markets as Japan exports only very small volumes (less than 1 per cent of production volumes) of fresh grapes each year. Grapes for export are kept separately throughout the process (Australian Department of Agriculture 2013).

Grapes packed by producers usually arrive at the packing house in the morning. At the packing house, packaged grapes are inspected by variety according to the agreed grading system, including signs of damage, freshness, number of bunches per box, size, shape and colour of bunches and how tightly packed the bunches are. Boxes containing any damaged grapes or which do not meet the required standard will be rejected and returned to the producer. Boxes that pass inspection will be stamped to indicate that they have been inspected. These boxes will then leave the packing house, usually by 3 pm on that same day, to the destination (Australian Department of Agriculture 2013).

Packing houses are cleaned, but not disinfected, daily (Australian Department of Agriculture 2013).

Figure 3.8 Processing of table grapes in the packing house

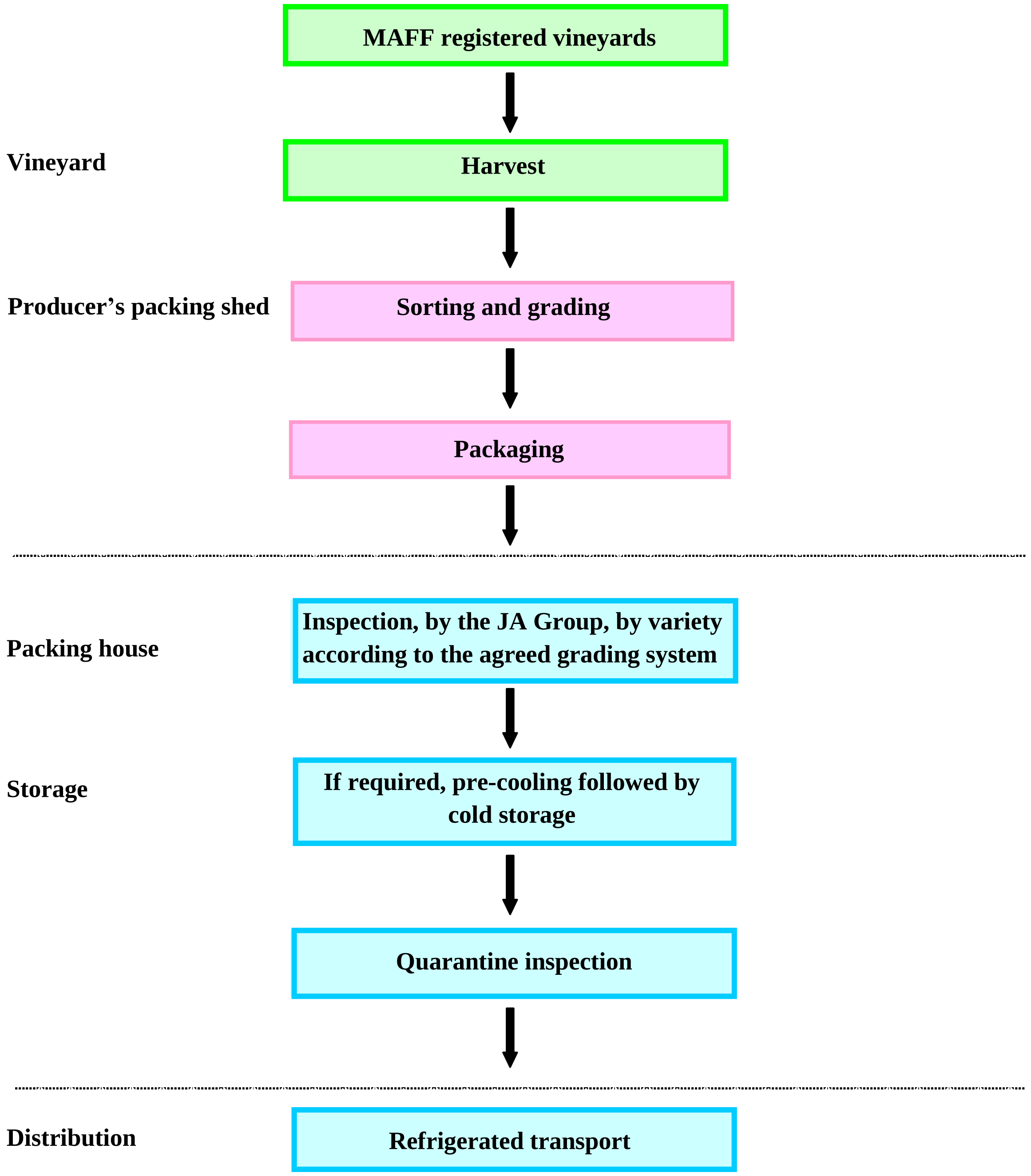
3.5.3 Export procedures

Japan only exports their top grade table grapes. Producers for export are required to attend their JA Group information sessions and the JA Group officers visit producers to ensure only credible producers are supplying grapes for export (Australian Department of Agriculture 2013; MAFF 2013e).

3.5.4 Storage and transport

In Japan, grapes are pre-cooled in forced-air rooms, where fumigation with sulphur dioxide occurs (Graham 2005). Grapes generally store well under cold temperatures. 'Kyoho' grape bunches can be stored for 30–50 days when wrapped with plastic films and stored at 0˚C and 80 per cent relative humidity (Morinaga 2001). New storage methods developed by Japan's National Institute of Fruit Tree Science using minus ion and ozone can extend the storage period by over 70 days (Morinaga 2001). When possible, shipping occurs immediately after harvest, but some storage may be necessary for cooling and transport logistics.

Figure 3.9 Summary of vineyard and post-harvest packing house, storage and distribution steps for table grapes grown in Japan for export



3.6 Export capability

3.6.1 Production statistics

Grape production in Japan is relatively small and the production has been on a decline in recent years (Mencarelli *et al.* 2005). As stated in section 3.3, table grapes account for about 87 per cent of total grape production, followed by wine grapes (about 11 per cent) and grapes for processing as juice (about 1 per cent) (Morinaga 2001). In 2008, the total production area for table grapes in Japan was 18 400 hectares, and total production was 201 000 metric tonnes (MAFF 2010a).

Grape production occurs on all four main islands in Japan. Grape production area and volume by prefectures in 2008 are presented in Table 3.3. Grape production area and volume in the intended export prefectures during 2010–2012 are presented in Table 3.4.

Table 3.3 Grape production area and volume by prefectures in 2008

Prefecture	Area (ha)	Volume (tonne)
Yamanashi	4 070	48 400
Nagano	2 300	29 200
Yamagata	1 720	19 600
Okayama	1 090	15 700
Fukuoka	964	10 200
Hokkaido	1 110	7 660
Osaka	482	6 170
Aichi	490	5 050
Aomori	449	4 220
Hiroshima	329	4 050
Niigata	346	3 670
Fukushima	274	3 210
Shimane	307	3 190
Iwate	356	3 050
Hyogo	341	3 020
Oita	343	2 920
Tochigi	255	2 680
Akita	194	2 390
Kagawa	205	2 000
Saitama	200	1 590
Ehime	177	1 540
Ishikawa	158	1 340
Gunma	136	1 140
Tottori	90	808
Shiga	58	615
Toyama	28	231
Total	**18 400**	**201 000**

Source: Japan Ministry of Agriculture, Forestry and Fisheries (2010a)

Table 3.4 Grape production area and volume in the intended export prefectures during 2010–2012

Prefecture	2010		2011		2012	
	Area (ha)	Volume (tonne)	Area (ha)	Volume (tonne)	Area (ha)	Volume (tonne)
Yamanashi	4 260	45 100	4 230	42 300	4 210	48 700
Nagano	2 440	23 900	2 440	23 400	2 430	30 300
Yamagata	1 740	19 700	1 720	18 600	1 700	20 200
Hiroshima	302	3 690	300	3 400	294	3 600
Oita	331	2 490	326	2 110	326	2 600
Kagawa	221	1 510	216	1 420	213	1 520

Source: Japan Ministry of Agriculture, Forestry and Fisheries (2013a)

3.6.2 Export statistics

Japan imports table grapes in much larger volume than its exports. Export volumes of fresh grapes from Japan during the recent years are listed in Table 3.5. Major importers of Japanese fresh grapes are Taiwan and Hong Kong (ITC Comtrade 2012). Both air and sea freight are used.

Table 3.5 Volumes and destinations of fresh grapes exported from Japan during 2008–2012

Destination	Volume (tonne)				
	2008	2009	2010	2011	2012
Taiwan	239	242	198	107	239
Hong Kong	141	138	101	69	108
Singapore	20	19	19	10	12
Thailand	0	0	0	1	1
Indonesia	0	1	0	0	0
Oman	2	1	0	0	0
Russia	3	1	0	0	0
Total	**406**	**403**	**319**	**187**	**360**

Source: ITC calculations based on UN COMTRADE statistics (2012)

3.6.3 Export season

Generally, Japanese fresh grapes are exported from June to December, with the peak volumes being exported from August to October and very small volumes (less than 20 tonnes) in other months (ITC Comtrade 2012).

4 Pest risk assessments for quarantine pests

Quarantine pests associated with table grapes from Japan are identified in the pest categorisation process (Appendix A). This chapter assesses the probability of the entry, establishment and spread of these pests and the likelihood of associated potential economic, including environmental, consequences.

Pest categorisation identified 39 quarantine pests associated with table grapes from Japan. Of these, 27 pests are quarantine pests of national concern and 12 pests are of regional concern. Table 4.1 identifies these quarantine pests. Additional quarantine pest data are given in Appendix B.

Assessments of risks associated with these pests are presented in this chapter.

Pest risk assessments already exist for some of the pests considered here as they have been assessed previously by the Department of Agriculture. For these pests, the likelihood of entry (importation and/or distribution) could be different from the previous assessment due to differences in the commodity, country and commercial production practices in the export areas, and hence will be re-assessed. After comparing factors relevant to the importation of table grapes from Japan with those for table grapes from China and/or California (such as time of year at which import takes place), the ratings of probability of distribution from the previous assessments for table grapes from China and/or California were adopted as the likelihood of distribution for table grapes from Japan would be similar to, or at least not higher than, that for table grapes from China and/or California. Unless there is new information to suggest otherwise, the probability of establishment and of spread in the PRA area, and the consequences the pests may cause will be the same for any commodity/country with which the pests are imported. Accordingly, there is no need to re-assess these components and the risk ratings given in the previous assessment will be adopted. For a pest that has previously been assessed and a policy already exists, this will be stated in the introduction of the pest risk assessment, and the superscript ‘EP’ (existing policy) is used to highlight this.

The quarantine risks posed by *Drosophila suzukii* from all countries and for all commodities, including table grapes, were previously assessed in the final pest risk analysis (PRA) report for *Drosophila suzukii* (DAFF Biosecurity 2013). Therefore, there is no need to re-assess this pest here. A summary of pest information and the likelihood estimates from the final PRA report for *D. suzukii* is presented in this chapter for convenience.

Some pests identified in this assessment have been recorded in some regions of Australia, and due to interstate quarantine regulations are considered pests of regional concern. These pests are identified with a superscript, such as ‘WA’ (Western Australia), for the state for which the regional pest status is considered.

The pre-harvest, harvest and post-harvest production practices, as described in Chapter 3, are taken into consideration in estimating the likelihood of pest introduction with table grapes from Japan. Key aspects being considered included:

- intensive production system practiced in Japan with appropriate pest management system, guided, trained and monitored by the respective JA Group
- fruit are sorted/graded/inspected to exclude any defected fruit and fruit with any signs of damage or pests in three steps, by producers at the producer’s packing shade, by JA Group

personnel at a packing house, and by MAFF officers during phytosanitary inspection pre-export

- only top grade table grapes will be exported
- the export volume will be very low. Due to Japan's limited export capability, it is expected that export volume will be less than 1 per cent of table grapes Australia currently imports from the United States of America (California) each year.

The department is aware of the recent changes in fungal nomenclature which ended the separate naming of different states of fungi with a pleiomorphic life-cycle. However, as the nomenclature for these fungi is in a phase of transition and many priorities of names are still to be resolved, this report still uses dual names for most fungi (consistent with the names used in the draft report). As official lists of accepted and rejected fungal names become available, these accepted names will be adopted.

Table 4.1 Quarantine pests for table grapes from Japan

Pest	Common name
Arthropods	
Ladybird (Coleoptera: Coccinellidae)	
Harmonia axyridis EP	Harlequin ladybird
Beetle (Coleoptera: Scarabaeidae)	
Popillia japonica EP	Japanese beetle
Fruit fly (Diptera: Drosophilidae)	
Drosophila suzukii EP	Spotted wing drosophila
Whitefly (Hemiptera: Aleyrodidae)	
Aleurolobus taonabae EP	Grape whitefly
Mealybugs (Hemiptera: Pseudococcidae)	
Crisicoccus matsumotoi EP	Matsumoto mealybug
Planococcus kraunhiae EP	Japanese mealybug
Planococcus lilacinus EP	Coffee mealybug
Pseudococcus comstocki EP	Comstock's mealybug
Phylloxera (Hemiptera: Phylloxeridae)	
Daktulosphaira vitifoliae EP	Grapevine phylloxera
Soft scale (Hemiptera: Coccidae)	
Parthenolecanium corni EP, WA	European fruit lecanium
Tortricid moths (Lepidoptera: Tortricidae)	
Eupoecilia ambiguella EP	Grape berry moth
Sparganothis pilleriana EP	Grapevine leafroller
Plume moths (Lepidoptera: Pterophoridae)	
Nippoptilia vitis EP	Grape plume moth
Platyptilia ignifera	Large grape plume moth
Moth (Lepidoptera: Oecophoridae)	
Stathmopoda auriferella EP	Apple heliodinid
Spider mite (Prostigmata: Tetranychidae)	
Tetranychus kanzawai EP, WA	Kanzawa spider mite

Thrips (Thysanoptera: Thripidae)	
Drepanothrips reuteri [EP]	Grape thrips
Frankliniella occidentalis [EP, NT]	Western flower thrips
Pathogens	
Bacteria	
Xylophilus ampelinus	Bacterial blight of grapevine
Fungi	
Diaporthe melonis var. *brevistylospora*	Berry drop
Greeneria uvicola [WA]	Bitter rot
Guignardia bidwellii [EP]	Black rot
Monilinia fructigena [EP]	Brown rot
Monilia polystroma [EP]	Asiatic brown rot
Pestalotiopsis menezesiana [WA]	Fruit rot
Pestalotiopsis uvicola [WA]	Fruit rot
Phakopsora euvitis [EP]	Grape rust fungus
Phomopsis sp.	Berry drop
Phomopsis viticola [EP, WA]	Phomopsis cane and leaf spot
Physalospora baccae [EP]	Grape cluster black rot
Pilidiella castaneicola [WA]	White rot
Pilidiella diplodiella [WA]	White rot
Viroids	
Citrus exocortis viroid [EP, WA]	
Grapevine yellow speckle viroid-1 [EP, WA]	
Grapevine yellow speckle viroid-3 [EP]	
Hop stunt viroid [EP, WA]	
Viruses	
Grapevine fanleaf virus [EP, WA]	
Tobacco necrosis viruses [EP]	
Tomato ringspot virus [EP]	

4.1 Harlequin ladybird

Harmonia axyridis[EP]

Harmonia axyridis, known as the harlequin ladybird or multicolored Asian lady beetle, is a relatively large coccinellid beetle (5–8mm) with a characteristic convex oval shape (Koch 2003).

The natural range of *H. axyridis* includes Japan, China, Korea and eastern Russia (Siberia) (Komai and Chino 1969; Koch 2003; Su *et al.* 2009). It has now established in many other countries in the Americas and Europe, indicating its potential as an invasive species (Lombaert *et al.* 2010). This includes the United States of America (US), Canada, Mexico (Koch *et al.* 2006), Argentina, Brazil (EPPO 2009a), Austria, Belgium, France, the Netherlands, Germany, Greece, Italy, Luxemburg, Switzerland and the United Kingdom (Roy and Roy 2008; Brown *et al.* 2008c). It is also reported as present in Poland, Serbia, Hungary, Romania, Slovakia and the Ukraine (EPPO 2009a).

Harmonia axyridis is associated with a wide range of arboreal (for example broadleaf and conifer) and herbaceous habitats (Ker and Carter 2004; Koch *et al.* 2006). *Harmonia axyridis* is a voracious predator of plant pests, especially aphids and other soft-bodied insects, and has been released as a classical bio-control agent in North America (Koch 2003) and Europe (Brown *et al.* 2008b).

The life history of *H. axyridis* is typical of coccinelids. It consists of the egg stage, four larval instars, pupae and adult. Eggs are 1.2 millimetres long and laid in clusters on leaves or stems of host plants (Koch 2003; Potter *et al.* 2005; Roy and Roy 2008). A female can lay 1000–4000 eggs in a lifetime at a rate of about 25 eggs in a day (Koch 2003; Roy and Roy 2008). Eggs hatch in three days at 26 °C. Larvae are 1.9–2.1 millimetres long at hatching and 7.5–10.7 millimetres long when fully grown (Koch 2003). At 26 °C, the larval stage lasts about 14 days. Larvae pupate on vegetation or occasionally on the external surfaces of buildings (Potter *et al.* 2005). Adults can live for up to three years (Koch 2003). Between two and four generations per year are recorded in Japan (Watanabe 2002).

Harmonia axyridis overwinters as an adult. In response to temperature, day length and food availability, adults migrate to hibernation sites, which include natural sites such as cracks in rock faces and man-made sites such as buildings (Koch 2003; Potter *et al.* 2005; Huelsman *et al.* 2010). In Ibaraki prefecture, Japan, this swarming to hibernation sites on buildings has been recorded between late October and early December, or between early and mid December (Watanabe 2002). In spring, beetles mate and disperse to feeding sites in search of prey (Koch 2003).

During autumn in the US, *H. axyridis* adults have been reported to aggregate on, and in some cases feeding on, fruits such as apples, pears and grapes (Koch 2003). In grapes, *H. axyridis* is considered a problem particularly in vineyards for wine making as it is difficult to remove this pest from grape bunches during harvest and some get crushed during processing, tainting the flavour of the resulting wine (Koch 2003). There have been anecdotal reports of *H. axyridis* contributing a taint to wine across a range of wine producing regions, including Europe (Pickering *et al.* 2006).

The risk scenario of concern for *H. axyridis* is that adults, and potentially larvae and pupae, may be present in imported grape bunches.

Harmonia axyridis was included in the final import policy for table grapes from China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and from California to WA (DAFF 2013). The assessment of *H. axyridis* presented here builds on these existing policies.

The probability of importation for *H. axyridis* was rated as 'high' in the assessment for table grapes from China (Biosecurity Australia 2011a) and California (DAFF 2013), and 'moderate' in the assessment for table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *H. axyridis* was rated as 'high' in the assessment for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b) and California (DAFF 2013). The probability of distribution after arrival in Australia of *H. axyridis* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *H. axyridis* will be imported into Australia with table grapes from Japan.

4.1.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *H. axyridis* will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Harmonia axyridis* is present in Japan (Brown *et al.* 2008b) on all the major islands and several smaller islands (Tadauchi and Inoue 2006). However, no records that associate this species with grapevines in Japan have been found.
- During autumn in the US, adults *H. axyridis* are known to aggregate, and in some cases feeding on, some fruits including grapes (Koch 2003).
- Roy and Roy (2008) reported that *H. axyridis* becomes a pest of apples and pears in late summer and autumn when aphids (its prey) are scarce, feeding and causing blemish on soft fruit.
- *Harmonia axyridis* does not appear to cause primary damage to the fruit, but will infest previously damaged fruit (Ker and Carter 2004; Galvan *et al.* 2006). However, there are accounts from growers that undamaged fruit can be affected (Kovach 2004). Results from a laboratory test showed that this species could feed on undamaged fruit, although they preferred to feed at sites of previous damage on the fruit (Kovach 2004).
- This pest is considered a problem in grapes for winemaking as it is difficult to remove them from grape bunches during harvest (Koch 2003; Roy and Roy 2008).
- However, unlike grapes for wine making, obvious insects such as *H. axyridis* are likely to be removed during commercial harvesting and packing processes for table grapes. Also,

as this species prefers to attack damaged fruit (Kovach 2004; Ker and Carter 2004), bunches that include obviously damaged berries are likely to be removed and not packed for export. Individual *H. axyridis* may remain within bunches containing unobvious damaged berries, especially where berries are tightly packed.

- While *H. axyridis* has often been intentionally introduced to new regions as a biocontrol agent, it has recently been accidentally introduced to several new regions from an invasive population in the US (Lombaert *et al.* 2010). This species was reported to be unintentionally introduced into Great Britain several times from both Europe and Canada (Brown *et al.* 2008c), suggesting that such introductions can be quite common.
- Adult *H. axyridis* typically live for 30 to 90 days but can live up to three years (Koch 2003). *Harmonia axyridis* overwinter as adults and are able to survive severe winters of northeast Asia and northeast North America. In Japan, hibernating beetles are known to survive temperatures as low as –16 °C (Watanabe 2002). Even when collected after hibernation ends adult *H. axyridis* are capable of surviving storage at –5 °C for up to 50 days (Watanabe 2002). Hence, the cold temperatures used to store and transport table grapes for export are unlikely to kill all *H. axyridis* if they are present.
- Koch and Galvan (Koch and Galvan 2008) stated that they are unaware of any reports of *H. axyridis* feeding on fruits in its native Asian range.

The wide distribution of *H. axyridis* in Japan and its ability to survive cold storage and transport, moderated by the preference of this species for damaged grapes, the likelihood that it will be removed from grape bunches during harvesting and packing processes for table grapes, a lack of reports of it feeding on fruit in its native Asian range and a lack of reports of it being associated with grapevines in Japan, supports a likelihood estimate for importation of 'low'.

Probability of distribution

As indicated above, the probability of distribution for *H. axyridis* assessed here would be the same as that for *H. axyridis* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b) and from California to WA (DAFF 2013), that is **High**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *H. axyridis* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.1.2 Probability of establishment and of spread

As indicated, the probability of establishment and of spread for *H. axyridis* will be the same as that assessed for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b) and from California to WA (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **High**

Probability of spread: **High**

4.1.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *H. axyridis* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**

4.1.4 Consequences

The consequences of the establishment of *H. axyridis* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b) and from California to WA (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**D**
Eradication, control	**D**
Domestic trade	**E**
International trade	**D**
Environment	**E**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences are estimated to be: **Moderate**.

4.1.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the outcome of overall consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Harmonia axyridis*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *H. axyridis* has been assessed as 'low', which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.2 Japanese beetle

Popillia japonica[EP]

Popillia japonica (Japanese beetle) belongs to the scarab beetle family (Scarabaeidae) (Tayutivutikul and Kusigemati 1992) and is native to Japan, northern China and parts of eastern Russia (EPPO 2006). *Popillia japonica* was introduced into North America where it was first found in 1916 and is now established throughout most of the eastern US (Hammons *et al.* 2009) as an economic pest (Fleming 1972). This species has become a more serious pest in the US than in its area of origin (Fleming 1972; EPPO 2006).

Popillia japonica has four life stages: egg, larva, pupa and adult (Fleming 1972). Adult *P. japonica* are about 8–11 millimetres long and 5–7 millimetres wide, with a bright metallic green body (Fleming 1972; EPPO 2006). Females mate up to four times, using a sex pheromone to attract a male for the first mating. All subsequent matings rely on high densities of both sexes present in feeding aggregations (Potter and Held 2002). After mating, females disperse to find suitable hosts. Eggs are laid individually in soil associated with roots of suitable grass hosts. Females lay between 40–60 eggs during their 4–6 week lifespan, which hatch in approximately two weeks. Larvae take 2–3 weeks and 3–4 weeks to pass through the first and second instars, respectively, with third instar larvae then overwintering. Development resumes in the spring once soil temperatures rise above 10 °C, with larvae taking a further 4–8 weeks to mature. After constructing a pupal chamber in the soil, larvae enter a pre-pupal stage lasting approximately 10 days. Adults emerge after spending 7–17 days as a pupa, but remain in the pupal chamber for between 2–14 days after emergence (Potter and Held 2002).

Adults *P. japonica* are mainly leaf-feeders, but will opportunistically feed on sugar-rich foods including flower petals and ripening fruit when available (Hammons *et al.* 2009). They are capable of biting through intact skin of ripe fruits and are attracted to chemicals released from leaves damaged by other *P. japonica* adults (Hammons *et al.* 2009). Recorded hosts include *Asparagus officinalis*, *Castanea crenata*, *Dahlia juorezii*, *Diospyros kaki*, *Glycine max*, *Malus* spp., *Prunus* spp., *Pueraria lobata*, and *Vitis vinifera* (Tayutivutikul and Kusigemati 1992). In Japan, adults of *P. japonica* are recognised as a pest, damaging leaves in orchards (Toyoshima *et al.* 2005).

Larvae feed on the roots of grasses and other plants present in pastures, lawns and sports fields (Fleming 1972). Home gardens can be badly affected by this species, as they provide a large range of adult and larval hosts growing in a small area (Fleming 1972).

The risk scenario of concern for *P. japonica* is that adult beetles may be present within imported grape bunches.

Popillia japonica was included in the final import policy for table grapes from China (Biosecurity Australia 2011a). The assessment of *P. japonica* presented here builds on this existing policy.

The probability of importation of *P. japonica* was rated as 'low' in the assessment for table grapes from China (Biosecurity Australia 2011a).

The probability of distribution for *P. japonica* was rated as 'high' in the assessment for table grapes from China (Biosecurity Australia 2011a). The probability of distribution after arrival in Australia of *P. japonica* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *P. japonica* will be imported into Australia with table grapes from Japan.

4.2.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *P. japonica* will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Popillia japonica* is native to Japan, where it is present on all four main islands (Fleming 1972; Tayutivutikul and Kusigemati 1992; Tadauchi and Inoue 2006), but is more abundant in northern Honshu and in Hokkaido where grasslands occur (Fleming 1972). Grapevine is listed among host plants for *P. japonica* in Japan (JSAE 1987).
- Although *P. japonica* is considered a serious pest of lawns and orchard crops in the US where it has been introduced, it is only a pest of minor importance in Japan and its population density in Japan never reaches that in the eastern US (Fleming 1972).
- In the US, *Popillia japonica* adults are known to gather in large groups on food plants and *Vitis vinifera* and *V. labrusca* are among the plant species being attacked (Fleming 1972). *Popillia japonica* is more abundant on grapes in Virginia, where there are large areas of pasture adjacent to vineyards, compared to other eastern states (Pfeiffer and Schultz 1986a). Pasture serves as habitat and food for *P. japonica* larvae (Fleming 1972; Pfeiffer and Schultz 1986a).
- Some Japanese vineyards, particularly on sloping land, maintain an understory of grass to prevent soil erosion (Morinaga 2001). It is not known if this grass is a suitable host for *P. japonica* larvae. If it is, this grass could provide habitat for *P. japonica* larvae and increase the prevalence likelihood of *P. japonica* adults in the vineyards.
- *Popillia japonica* adults initially attack the leaves of their hosts, but opportunistically exploit sugar-rich fruits (Hammons *et al.* 2009). Pfeiffer (1986a) reported that although *P. japonica* feed on fruits of some crops, such as peach, this species mainly feeds on grapevine foliage and rarely on grape berries.
- *Popillia japonica* has a range of feeding behaviours, from nibbling leaves to skeletonising them and feeding on fruit until only a core or stone remains (Fleming 1972).
- In Japan, appearance and skin colour of grape bunches are regarded as very important quality components and cluster trimming, berry thinning and checking berry colour against standard colour chart are important practices in table grape production (Morinaga 2001).

- Adults of *P. japonica* are about 8–11 millimetres long, 5–7 millimetres wide and are a bright metallic green in colour (Fleming 1972).
- The intensive practices in table grape production in Japan to achieve high quality grape bunches; and the large size and contrasting pattern of *P. japonica* adults make it more likely that adults of *P. japonica*, if present, on grape bunches will be detected and removed from the pathway.
- Adult *P. japonica* can survive temperatures as low as –20 °C without prior cold conditioning (Payne 1928). Temperatures used for cold storage of grapes are unlikely to kill *P. japonica* adults. Cold conditions may improve the ability of *P. japonica* to survive transport to Australia by halting its movement and increasing its lifespan (Fleming 1972).

The presence of *P. japonica* in Japan, their opportunistic feeding on host fruits and their capacity to survive cold storage, moderated by the lack of reports of the association of this species with grape bunches in Japan, the rarity of records of grape berries being attacked by this species in the US where it is recognised as a major pest and the likelihood that the beetle, if present, will be detected and removed during fruit thinning, harvesting and packing processes due to their large size and contrasting colour patterns, support a likelihood estimate for importation of 'low'.

Probability of distribution

As indicated above, the probability of distribution for *P. japonica* assessed here would be the same as that for *P. japonica* for table grapes from China, that is **High**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *P. japonica* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.2.2 Probability of establishment and of spread

As indicated, the probability of establishment and of spread for *P. japonica* will be the same as that assessed for table grapes from China (Biosecurity Australia 2011a). That assessment used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessment are presented below:

Probability of establishment: **High**

Probability of spread: **High**

4.2.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *P. japonica* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.2.4 Consequences

The consequences of the establishment of *P. japonica* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**E**
Eradication, control	**E**
Domestic trade	**D**
International trade	**C**
Environment	**D**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences are estimated to be: **Moderate**.

4.2.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the outcome of overall consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Popillia japonica*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *P. japonica* has been assessed as 'low', which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.3 Spotted wing drosophila

Drosophila suzukii[EP]

As mentioned, the quarantine risks posed by *Drosophila suzukii* from all countries and for all commodities, including table grapes, were previously assessed in the final pest risk analysis (PRA) report for *Drosophila suzukii* (DAFF Biosecurity 2013). Therefore, there is no need to re-assess this pest here. A summary of pest information and previous assessments from the final PRA report for *D. suzukii* is provided here.

The potential for the introduction of *D. suzukii* into Australia, via imports of currently traded host fruit, resulted in Australia introducing emergency quarantine measures prior to the re-commencement of trade. The emergency measures were announced on 7 April 2010 for table grapes (*Vitis* spp.), cherries, strawberries and stone fruit for human consumption from all countries. The Department of Agriculture issued a draft PRA report on 21 October 2010 for comment and the final PRA report for *D. suzukii* was released on 23 April 2013. The final PRA report, which recommends ongoing measures, meets Australia's international obligations under the World Trade Organization's Agreement on the Application of Sanitary and Phytosanitary Measures.

Drosophila suzukii is considered native to Asia (Kanzawa 1935; Dreves *et al.* 2009) and recent genetic analysis supports this view (Ometto *et al.* 2013). It is considered to be widespread in Japan (Kanzawa 1935).

The total development time of *D. suzukii* (egg to adult) ranges from 8–28 days in the field in Japan (Kanzawa 1935; Kanzawa 1939). The duration is dependent on seasons, with shorter life cycles in summer. Typically eggs hatch in one day, but can hatch as quickly as 20 hours or take as long as four days (Kanzawa 1939). On average larval development takes 3–10 days and pupation taking 4–14 days (Kanzawa 1939). Adults become sexually mature in one to two days and live for 21–66 days. Females can lay an average of 380 eggs in their life (Kanzawa 1939). Adults are extremely sensitive to low humidity/moisture (Van Steenwyk 2010). In Japan, adults were identified as the overwintering life stage (Kanzawa 1939). For diapausing adults, overwintering survival can be affected by low temperatures where a constant temperature of -1.8 °C and –0.7 °C for 24 hours will kill 75 per cent of the females and males respectively (Kimura 2004).

The larval feeding of early instars causes the fruit to collapse around the oviposition scar and, if attack rates are high, the entire fruit can collapse. The oviposition scar exposes the fruit to secondary attack by pathogens and other insects (Hauser and Damus 2009). The damage caused by *D. suzukii* larvae renders the fruit unsuitable for sale (Bolda *et al.* 2010).

Drosophila suzukii preferentially oviposits on ripe fruit but will also oviposit on unripe and over-ripe fruit (Kanzawa 1939; Lee *et al.* 2011; Brewer *et al.* 2012). Larvae feeding in fruit that is very acidic fail to complete development (Kanzawa 1935). In its native and introduced range, *D. suzukii* has been recorded to cause damage to a range of fruits including grapes, cherry, blueberry and red bayberry, mulberries, peaches, plums, strawberries and various caneberries. Studies in Japan have shown severe crop losses of 80 per cent for grapes and 26–100 per cent for cherries (Kanzawa 1939).

On grapes, oviposition trials on wine and table grapes have shown that fully-ripe table grapes are attacked at high levels. Damaged fruit with low sugar levels will be oviposited in but larvae develop poorly and fail to pupate (Maiguashca *et al.* 2010). Kanzawa (1939) recorded that different grape varieties sustained different levels of attack and considered skin thickness was the factor that limited oviposition. Oviposition of *D. suzukii* has been reported on a number of grape varieties/cultivars which are 100 per cent *Vitis vinifera,* such as 'Gros Coleman', 'Muscat of Alexandra', 'Muscat of Hamburg', 'Foster's Seeding', 'Rose de Italy', 'Kyoshin' (Kanzawa 1939), 'Thompson Seedless' (Lee *et al.* 2011), 'Black Manuka' and 'Perlette' (WSUE 2010). Reports of oviposition on grape varieties/cultivars which are 100 per cent *Vitis labrusca* have not been found. There have been reports of a number of grape varieties/cultivars not being attacked by *D. suzukii,* some of these are 100 per cent *Vitis vinifera* (for example 'Koshu', 'Chasselas de Fontainbleau', 'Golden Champion' and 'White Malaga'), some are 100 per cent *Vitis labrusca* (for example 'Concord', 'Eaton', 'Niagara' and 'Hostess Seedling') (Kanzawa 1939), and some are hybrids between *V. vinifera* and *V. labrusca* for which percentage of *V. vinifera* as parentage range from 25 per cent (for example 'Early Campbell') (Maiguashca *et al.* 2010) to 75 per cent (for example 'Brighton') (Kanzawa 1939).

When *D. suzukii* is given a choice between several host fruits (for example raspberry, cherry, strawberry, grape), grape ('Thompson Seedless') was the least preferred host (Lee *et al.* 2011).

During the 1930s in Japan, *D. suzukii* was trapped in vineyards at high levels and there are reports of damage as high as 80 per cent (Kanzawa 1939). More recently there have been reports of outbreaks of *D. suzukii* on grapes in Hokkaido (CFIA 2010). In the USA, *D. suzukii* has been recorded from grapes though infestation rates remained low in 2010 (OSU 2010).

The risk scenario of concern for *D. suzukii* is the presence of the internal life stages in mature bunches of grapes.

4.3.1 Probability of entry, of establishment and of spread

The final PRA report for *D. suzukii* (DAFF Biosecurity 2013) assessed the probability of importation as 'moderate' for table grapes (*Vitis vinifera*). However, the report concluded that for varieties/ cultivars of *Vitis labrusca*, the probability of importation is 'very low'.

Consistent with Australia's international obligations under the SPS Agreement, and as considered in the final PRA report for *D. suzukii* (DAFF Biosecurity 2013), the Australian Department of Agriculture will consider suitable evidence that supports the poor association, or non host status, of *D. suzukii* with a particular variety/cultivar of table grape (*Vitis vinifera* or hybrids). This information would be taken into consideration in developing import conditions that achieve Australia's ALOP.

The final PRA report for *D. suzukii* (DAFF Biosecurity 2013) concluded that probability of distribution, of establishment and of spread would be the same for varieties/ cultivars of *V. vinifera* and of *V. labrusca*. The ratings from that final PRA report are presented below:

	V. vinifera	*V. labrusca*
Probability of importation	**Moderate**	**Very low**
Probability of distribution:	**High**	**High**
Overall probability of entry:	**Moderate**	**Very low**
Probability of establishment:	**High**	**High**
Probability of spread:	**High**	**High**

4.3.2 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *D. suzukii* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia: **Moderate.**

However, for *Vitis labrusca* and varieties/cultivars of *Vitis vinifera* or hybrids where poor host status of commercial quality grapes for oviposition by *D. suzukii* can be demonstrated the overall probability of entry, establishment and spread would be: **Very low**.

4.3.3 Consequences

The consequences of the establishment of *D. suzukii* in Australia were estimated previously for all commodities for the *Final pest risk analysis report for Drosophila suzukii* (DAFF Biosecurity 2013). This estimate of impact scores is provided below.

Plant life or health	**F**
Other aspects of the environment	**B**
Eradication, control	**E**
Domestic trade	**E**
International trade	**E**
Environment	**D**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**F**', the overall consequences are estimated to be **High**.

4.3.4 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

For varieties/cultivars of *Vitis vinifera*:

Unrestricted risk estimate for *Drosophila suzukii*	
Overall probability of entry, establishment and spread	**Moderate**
Consequences	**High**
Unrestricted risk	**High**

For varieties/cultivars of *Vitis labrusca* (also for varieties/cultivars of *Vitis vinifera* or hybrids where poor host status of commercial quality grapes for oviposition by *D. suzukii* can be demonstrated):

Unrestricted risk estimate for *Drosophila suzukii*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**High**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *D. suzukii* of 'high' or 'low' exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.4 Grape whitefly

Aleurolobus taonabae[EP]

Aleurolobus taonabae, commonly known as the grape whitefly, is a 1.2 millimetres long insect (Li 2004) belonging to the whitefly family (Aleyrodidae). Adult whiteflies are tiny, white-winged moth-like insects (Miller *et al.* 2010). They are major pests of tropical and subtropical crops and of protected crops in temperate regions (Caciagli 2007).

Known hosts of *A. taonabae* include *Mallotus japonicus* (Euphorbiaceae), *Terstroemia japonica* (Theaceae) (Takahashi 1954), hawthorn (*Crataegus* spp.) (Li 2004), *Cercis chinensis* (Fabaceae), *Pittosporum tobira* (Pittosporaceae), *Osmanthus fragrans* (Oleaceae) and *Vitis vinifera* (Vitaceae) (Evans 2008; Dubey and Ko 2009). Given these hosts are from widely differing plant families it is likely that other, as yet unrecorded hosts, occur. Little information on the ecology of this pest appears to be available.

Aleurolobus taonabae is known from China, Japan, India and Taiwan (Dubey and Ko 2009). In Japan, it is recorded from the island of Honshu (Tadauchi and Inoue 2006).

Whiteflies have several generations per year (Blodgett 1992). Information on the number and behaviours of *A. taonabae* generations in Japan could not be found and it is presumed here to be similar to those occurring in China.

Three generations of *A. taonabae* per year are recorded in China (Li 2004). In China, eggs overwinter on hawthorn bushes and hatch the following spring. First generation adults emerge in late May and leave hawthorn bushes and fly to grapevines to lay eggs on leaves. Eggs are scattered on grape leaves and hatched nymphs mostly feed on the back of grape leaves. Second generation adults emerge from late July to mid-August and also lay eggs on grapevine leaves. Adults and hatching nymphs continue to damage leaves and ripening fruit of grapevines. Third generation adults emerge in September and these lay eggs on other hosts for example hawthorn (*Crataegus* spp.) (Li 2004). Whitefly nymphs become motionless once they reach the feeding stage and remain with the food source until pupating and emerging into adults (Blodgett 1992; Miller *et al.* 2010). Damage to the grape bunches occurs when second generation *A. taonabae* adults and nymphs suck nutrients from ripening berries, leading to damage that reduces both yield and quality of the fruit (Li 2004). During the feeding process, whiteflies excrete honeydew, which can encourage the growth of sooty moulds on the plant host and may affect the quality of grape bunches (Blodgett 1992; University of California 1999).

The risk scenario of concern for *A. taonabae* is that second generation adults and their nymphs may be imported in table grape bunches.

Aleurolobus taonabae was included in the final import policy for table grapes from China (Biosecurity Australia 2011a) (as *Aleurolobus taeonabe*). The assessment of *A. taonabae* presented here builds on this existing policy.

The probability of importation for *A. taonabae* was rated as ‘moderate’ in the assessment for table grapes from China (Biosecurity Australia 2011a).

The probability of distribution for *A. taonabae* was rated as ‘moderate’ in the assessment for table grapes from China (Biosecurity Australia 2011a). The probability of distribution after arrival in Australia of *A. taonabae* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *A. taonabae* will be imported into Australia with table grapes from Japan.

4.4.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *A. taonabae* will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Aleurolobus taonabae* has been recorded on grapevine (*Vitis vinifera*) in Japan (JSAE 1987). The species is found on Honshu Island (Tadauchi and Inoue 2006). It was reported to be localised to Tokyo and was described as ‘rather scarce’ (Takahashi 1954).
- *Aleurolobus taonabe* adults and nymphs have been reported to associate with ripening grape berries (Li 2004).
- Whitefly nymphs become sessile when they start feeding and do not move from the feeding site until after pupation (Blodgett 1992; Miller *et al.* 2010).
- *Aleurolobus taonabae* nymphs range from 0.3 to 1 millimetres in length and adults are 1.2 millimetres long (Li 2004). This could make it difficult to detect low levels of infestation. However, grapes with high levels of infestation are likely to be detected and discarded at harvest or during sorting and packing procedures.
- Whilst feeding on leaves and fruit, whitefly adults and nymphs excrete honeydew on which black, sooty moulds may grow (Blodgett 1992; University of California 1999). Sooty mould is easily detected and infested grapes with sooty mould are likely to be discarded at harvest or during sorting and packing procedures.
- It is not known if *A. taonabae* nymphs and adults associated with table grape bunches are able to survive cold storage during transportation. However, whitefly nymphs are generally resistant to cold (Caciagli 2007).

The association of adults and nymphs with grape bunches and their small size, moderated by the limited distribution of this pest in Japan and visible sooty mould on infested bunches, supports a likelihood estimate for importation of ‘low’.

Probability of distribution

As indicated above, the probability of distribution for *A. taonabae* assessed here would be the same as that for *A. taonabae* for table grapes from China (Biosecurity Australia 2011a), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *A. taonabae* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.4.2 Probability of establishment and of spread

As indicated, the probability of establishment and of spread for *A. taonabae* will be the same as that assessed for table grapes from China (Biosecurity Australia 2011a). That assessment used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessment are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.4.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *A. taonabae* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.4.4 Consequences

The consequences of the establishment of *A. taonabae* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**B**
Eradication, control	**D**
Domestic trade	**D**
International trade	**C**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for *A. taonabae* are estimated to be: **Moderate**.

4.4.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Aleurolobus taonabae*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *A. taonabae* has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.5 Mealybugs

Crisicoccus matsumotoi[EP], *Planococcus kraunhiae*[EP], *Planococcus lilacinus*[EP] and *Pseudococcus comstocki*[EP]

Crisicoccus matsumotoi (Matsumoto mealybug), *Planococcus kraunhiae* (Japanese mealybug), *Pl. lilacinus* (Coffee mealybug) and *Pseudococcus comstocki* (Comstock's mealybug) belong to the Pseudococcidae or mealybug family. They have been grouped together because of their related biology and taxonomy, and are predicted to pose a similar risk and to require similar mitigation measures. In this assessment, the term 'mealybug' is used to refer to these four species. The scientific name is used when the information is about a specific species.

Mealybugs are small, oval, soft-bodied insects that are covered with a white, cottony or mealy wax secretion that is moisture repellent and protects them against desiccation (University of Minnesota 2007). Mealybugs are sucking insects that injure plants by extracting large quantities of sap. This weakens and stunts plants, causing leaf distortion, premature leaf drop, dieback and even plant death (University of Minnesota 2007). They may also cause indirect damage by injecting toxins or plant pathogens into host plants (Rohrbach *et al.* 1988; Williams 2004). Mealybugs detract from the appearance of the plant by contaminating grape bunches with egg sacs, nymphs and adults (Spangler and Agnello 1991). They may also deposit a waste product, 'honeydew', on the leaves and fruit as they feed. Honeydew may act as a substrate for sooty mould to grow (Spangler and Agnello 1991).

Female mealybugs have three life stages: egg, nymph and adult. They develop from eggs through three nymphal (immature instar) stages before undergoing a final moult into the adult form (CABI 2012). Male mealybugs have four life stages: egg, nymph, cocoon and adult. They develop from eggs through first and second nymphal instars, which feed from the host, and third and fourth non-feeding instars in a cocoon (University of Minnesota 2007). Male mealybugs then moult into tiny winged adults that are short lived and do not feed, existing only to fertilise females (University of Minnesota 2007).

Mealybugs generally prefer warm, humid, sheltered sites away from adverse environmental conditions and natural enemies. Mealybug nymphs and adult females are very small and are often not detected as they hide in crevices and in protected spaces on host plants (Williams 2004). This makes them a potentially serious pest problem in grape-growing areas. Many mealybug species pose particularly serious problems to agriculture when introduced into new areas of the world where natural enemies are not present (Miller *et al.* 2002).

Crisicoccus matsumotoi is an important pest of fruit trees in Japan (Ben-Dov *et al.* 2012). Its hosts include grape, pear, fig, persimmon, walnut and maple (Shiraiwa 1935; Ben-Dov *et al.* 2012).

Planococcus kraunhiae is a pest of fruit trees, including pear, citrus, persimmon and grape (Narai and Murai 2002).

Planococcus lilacinus has an extremely wide host range representing 35 families, including grape, coffee, guava, and various citrus varieties (Espinosa and Hodges 2008; CABI 2012).

Pseudococcus comstocki is a pest on several fruit species including grape (MAFF 2008a), plum and pear (Ben-Dov 2012c).

The risk scenario of concern is that mealybug eggs, nymphs or adult females may be present in sheltered areas on imported grape bunches.

Planococcus kraunhiae, *Pl. lilacinus* and *Ps. comstocki* were assessed in the import policy for unshu mandarin from Japan (Biosecurity Australia 2009). *Pseudococcus comstocki* and *Pl. kraunhiae* were assessed in the import policy for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The current assessment of these mealybug species builds on these existing policies.

The probability of importation for mealybugs was rated as 'high' in the assessment for unshu mandarins from Japan (Biosecurity Australia 2009) and for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b).

The probability of distribution of mealybugs was rated as 'moderate' in the assessment for unshu mandarins from Japan (Biosecurity Australia 2009). Due to the differences in fruit morphology between unshu mandarins and table grapes, probability of distribution was re-assessed, but was still rated as 'moderate' for table grapes from China (Biosecurity Australia 2011a) and was adopted for table grapes from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of mealybugs for table grapes from Japan will not differ from that for table grapes from China. The probability of establishment and of spread in Australia, and the consequences they may cause will be the same for any commodity in which these species are imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that mealybugs will be imported into Australia with table grapes from Japan.

4.5.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that these mealybugs will arrive in Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- *Crisicoccus matsumotoi* is an important pest of grapevine in Japan (Ben-Dov *et al.* 2012) and has been recorded (under its synonym *Pseudococcus matsumotoi*) from all four major islands (Shiraiwa 1935).
- *Planococcus lilacinus* is recorded as an economic pest of citrus in Japan (JSAE 1987), but is recorded only from Okinawa and other small islands to the south of Japan (Tadauchi and Inoue 2006). Although grape is a recognised host for this species (Ben-Dov 2012c) and this mealybug species has been recorded infesting grape bunches in India (Tandon and Verghese 1987), no records have been found associating *Pl. lilacinus* with grapes in Japan.

- *Planococcus kraunhiae* and *Ps. comstocki* are present in Japan on Honshu, Shikoku and Kyushu (Tadauchi and Inoue 2006) and grapevine is listed among the host plants for these species in Japan (JSAE 1987).
- Mealybug eggs are usually laid under the bark of their host (Spangler and Agnello 1991; Flaherty *et al.* 1992b). *Planococcus lilacinus* eggs develop within the female and emerge as crawlers (Espinosa and Hodges 2008). *Pseudococcus matsumotoi* eggs can develop within the female or can be deposited and hatch later (Shiraiwa 1935). However, *Ps. comstocki* is known to occasionally lay eggs on the fruit of its hosts (Spangler and Agnello 1991). Some females from a related species of grape-feeding mealybug, *Pseudococcus maritimus*, have been recorded laying eggs within grape bunches (Flaherty *et al.* 1992b).
- Due to their high fecundity and the production of several generations per year, mealybugs can quickly build up resistance to commercial insecticides (Franco *et al.* 2004).
- Mealybugs are difficult to detect due to their small size and generally remain anchored to the host once they begin feeding (Williams 2004). Mealybugs have a protective coating and routine packing house procedures may not remove all mealybugs from the fruit (Taverner and Bailey 1995). For example, it has been reported that infested apples can retain some mealybugs, particularly eggs, on the stem even after thorough washing and brushing (Walker and Bradley 2006). In general, packing processes of table grapes do not involve washing or brushing. When this is coupled with the morphology of grape bunches, it is even less likely that mealybugs if present in grape bunches will be detected and/or removed during packing processes.
- There is a strong potential for mealybugs to survive cold storage and transport as live mealybugs have been intercepted on Chilean table grapes imported into New Zealand (MAF Biosecurity New Zealand 2009c). Mealybugs, including the assessed species, have been detected several times on fruit consignments moving in international trade (Miller *et al.* 2002; MacLeod 2006).

The association of mealybugs with fruit, their small size, the sessile and cryptic nature of most life stages and previous interception records of mealybugs on grape bunches on arrival in importing countries supports a likelihood estimate for importation of 'high'.

Probability of distribution

As indicated above, the probability of distribution for mealybugs assessed here would be the same as that for mealybugs for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that mealybugs will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Moderate**.

4.5.2 Probability of establishment and of spread

As indicated, the probability of establishment and of spread for these mealybugs will be the same as that assessed for unshu mandarins from Japan (Biosecurity Australia 2009), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.5.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that mealybugs will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Moderate.**

4.5.4 Consequences

The consequences of the establishment of mealybugs in Australia have been estimated previously for unshu mandarins from Japan (Biosecurity Australia 2009), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**D**
Other aspects of the environment	**C**
Eradication, control	**D**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences are estimated to be: **Low**.

4.5.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Crisicoccus matsumotoi*, *Planococcus kraunhiae*, *Planococcus lilacinus* and *Pseudococcus comstocki*	
Overall probability of entry, establishment and spread	**Moderate**
Consequences	**Low**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for the assessed mealybug species has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for these pests.

4.6 Grapevine phylloxera

Daktulosphaira vitifoliae[EP]

Daktulosphaira vitifoliae is commonly known as the grape phylloxera or grapevine root-aphid and belongs to the Phylloxeridae family within the superfamily Aphidoidea. *Daktulosphaira vitifoliae* attacks the roots and/or leaves of some species in the genus *Vitis*, including those of commercial grapevines. This pest can cause considerable losses in vineyards (INRA 2009) by decreasing the vigour and yield in infested vines and usually leads to the death of the host (PGIBSA 2003).

Daktulosphaira vitifoliae is present on the island of Honshu and produces 5–10 generations there per year (MAFF 2008a). This species originated in parts of North America but has since spread throughout North and South America, Europe, parts of Africa, India, China, Korea and Japan (CABI 2013). *Daktulosphaira vitifoliae* also has a limited distribution in Australia, where it is a domestic quarantine pest and strict quarantine restrictions have been in place since 1917 (Umina *et al.* 2007). It is under official control and restricted to parts of New South Wales and Victoria (Loch and Slack 2007; PGIBSA 2009).

The life cycle of *D. vitifoliae* has recently been reviewed by Forneck and Huber (2009). During spring and summer *D. vitifoliae* reproduces parthenogenetically on roots and/or on leaves of susceptible plants. Wingless females are 0.8–1.5 millimetres long, produce eggs up to 0.25–0.3 millimetres long and 0.18–0.2 millimetres wide (Forneck and Huber 2009) with approximately 50 eggs (Granett *et al.* 2001) or up to 400–600 eggs (Skinkis *et al.* 2009) produced per female. The number of parthenogenetic generations produced ranges from 3–4 (Forneck and Huber 2009) to 3–10 (Granett *et al.* 2001), with 5–10 being the norm in Japan (MAFF 2008a). These eggs hatch into the first instar (crawler stage) that can move between leaves and roots (Forneck and Huber 2009) and can occasionally be found on fruit (Buchanan and Whiting 1991). Three typically sedentary instars occur before the adult is produced (Granett *et al.* 2001). These later instars can relocate to another feeding site if disturbed (Kingston *et al.* 2009). For populations living on roots the first instar is considered to be the overwintering stage (Granett *et al.* 2001).

During summer and autumn the wingless females living on roots produce winged sexupara (Forneck and Huber 2009) also often termed alates that move to the leaves and may fly to disperse (Granett *et al.* 2001). Where the environment is suitable, the sexupara then go on to produce four to eight eggs per female which are laid under the bark and produce non-feeding male and female sexuals (Forneck and Huber 2009). After mating, the female lays a single sexual egg under bark. This is an overwintering stage which hatches into a fundatrix next spring. This fundatrix stage produces the next round of wingless females (Forneck and Huber 2009).

On leaves during summer to late autumn, the wingless females do not produce alates and instead produce wingless sexupara and the life cycle continues as described above except that the number of sexual eggs produced by these wingless sexupara ranges between 1–63, but if they are producing asexual eggs the range is between 1–90 (Downie and Granett 1998). Based on the different data sources quoted above, the number of asexual eggs produced seems to vary between 1–600 per female. There is no explanation in the literature for such a wide ranging level of fecundity but possibly there are genotypic and climatic factors involved.

Wingless females on roots can also produce wingless sexupara that produce sexuals that produce eggs that hatch into a fundatrix that can feed on roots and produce wingless females (2009).

Daktulosphaira vitifoliae populations on *V. vinifera* generally only attack the roots (Corrie *et al.* 2002), but leaf gall symptoms on *V. vinifera* cultivars have been recorded in Brazil (Botton and Walker 2009) and Hungary (Molnár *et al.* 2009). The roots of American species *V. berlandieri, V. rupestris* and *V. riparia* are resistant to attack (Skinkis *et al.* 2009), but their resistance to leaf attack appears to vary depending on the *D. vitifolia*e genotype (Downie *et al.* 2000; Granett *et al.* 2001).

The risk scenario of concern for *D. vitifoliae* is that crawlers and potentially winged adults may be imported in table grape bunches. *Daktulosphaira vitifoliae* may become established outside of its existing limited distribution in eastern Australia. It may then spread throughout the wine, table grape and dried fruit growing regions of Australia, with potential serious consequences for these grape based industries.

Daktulosphaira vitifoliae was included in the final import policy for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The assessment of *D. vitifoliae* presented here builds on these existing policies.

The probability of importation for *D. vitifoliae* was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b).

The probability of distribution for *D. vitifoliae* was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of *D. vitifoliae* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between the previous export areas and Japan make it necessary to reassess the likelihood that *D. vitifoliae* will be imported into Australia with table grapes from Japan.

4.6.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *D. vitifoliae* will arrive in Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Daktulosphaira vitifoliae* is present in Japan on the island of Honshu (Tadauchi and Inoue 2006), where it is recorded on the roots and leaves of grape (MAFF 2008a).

- Grapevines in Japan are grown on rootstock from *Vitis* species that are resistant to phylloxera, such as 5C and 5BB, and vineyards are monitored for this pest (MAFF 2008a).
- Use of resistant rootstocks is a recognised means to control *D. vitifoliae* in vineyards (Buchanan and Whiting 1991; Fergusson-Kolmes and Dennehy 1993; Granett *et al.* 2001). However, *D. vitifoliae* still occur in major grape-growing countries where resistant rootstocks are widely used (Corrie *et al.* 2002). Above ground vine damage is absent when grapevines are grown on resistant rootstock (Granett *et al.* 2001). Therefore, infestations may not be obvious unless the roots are inspected. Loch and Slack (2007) report that yellowing of vines may not occur until two to three years after infestation, delaying detection.
- Grape bunches are listed among important distribution routes for phylloxera (Powell 2012).
- First instars, or crawlers, are the most common dispersive stage of phylloxera and can be associated with any part of the vine, including grape bunches (Buchanan and Whiting 1991; Powell 2012).
- First instar crawlers are about 0.3 millimetres long (King and Buchanan 1986). Owing to their small size, it is unlikely that *D. vitifoliae*, if present on bunches, will be observed during routine field management, harvesting and packing house procedures.
- The winged adult is another dispersive life stage of phylloxera, which can move above and below ground (Forneck and Huber 2009). There appear to be no specific records of winged adults being found on grape bunches, but due to their dispersal capacity winged adults may potentially be present on grape bunches.
- Packed grapes are often transported in cold storage to prolong shelf life. It is unknown if *D. vitifoliae* will survive in table grapes under routine commercial conditions during cold storage and transportation. The crawlers have been reported to survive under water at 5 °C for seven days (Korosi *et al.* 2009) and without food for seven days at 25 °C (Kingston *et al.* 2009). For populations living on roots, the first instar is considered to be the overwintering stage (Granett *et al.* 2001). The first instar may survive temperatures associated with cold storage and transport.

The association of crawler and potentially winged adult dispersal stages of *D. vitifoliae* with grape bunches, their small sizes and uncertaintay about their ability to survive storage and transport conditions, support a likelihood estimate for importation of 'moderate'.

Probability of distribution

As indicated above, the probability of distribution for *D. vitifoliae* assessed here would be the same as that for *D. vitifoliae* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *D. vitifoliae* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.6.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *D. vitifoliae* will be the same as that assessed for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **High**

Probability of spread: **Moderate**

4.6.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *D. vitifoliae* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low.**

4.6.4 Consequences

The consequences of the establishment of *D. vitifoliae* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**A**
Eradication, control	**E**
Domestic trade	**D**
International trade	**C**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for *D. vitifoliae* are estimated to be: **Moderate**.

4.6.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Daktulosphaira vitifoliae*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *D. vitifoliae* has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.7 European fruit lecanium

Parthenolecanium corni EP, WA

Parthenolecanium corni is not present in the state of Western Australia and is a pest of regional concern for that state.

Parthenolecanium corni is divided into two sub species, *P. corni* ssp. *corni* and *P. corni* ssp. *apuliae* (Ben-Dov 2012a). *Parthenolecanium corni corni* has a wide geographic distribution, being found extensively across the Palaearctic, Nearctic, Neotropical, Oriental and Australasian regions, while *P. corni apuliae* is found exclusively on grapevines in Italy (Ben-Dov 2012a). To date, research on this scale has only been conducted to species (*P. corni*) level. Due to the comparatively narrow distribution of *P. corni apuliae*, the remainder of this assessment assumes research to be based on *P. corni corni* and will use *P. corni* interchangeably with this sub-species.

Parthenolecanium corni belongs to the soft scale insect family Coccidae. Soft scales are small and often inconspicuous and are covered with a wax secretion that covers adult females and immature males. There are three life stages; egg, nymph and adult. Adult male scales have a short life span and are rarely observed (Smith *et al.* 2012).

The first and second instar nymphs (crawlers) have functional legs (David'yan 2009) and are the main dispersal stage. Crawlers may be dispersed by wind, animals and by human transport of infested material.

Parthenolecanium corni overwinter as second instar nymphs on trunks and underside of branches (David'yan 2009). In spring, the nymphs migrate to young stems (David'yan 2009) where they feed and produce large amounts of honeydew (Phillips 1992). These nymphs remain there for the rest of their life cycle (David'yan 2009) and mature into adults (Bentley *et al.* 2009). Adult males are very small (1.7 millimetres long), winged and are rare (David'yan 2009). Adult females are small (3–6.5 millimetres long, 2.0–4.0 millimetres in width and 4.0 millimetres in height) and covered in a shiny brown domed shell (Bentley *et al.* 2009). They are sessile and reproduce primarily parthenogenetically (without mating), laying 1000–3000 eggs at the end of spring beneath their body, under their shell (David'yan 2009). Crawlers hatch from the eggs during early summer, migrate to the shoots and leaves to feed (Bentley *et al.* 2009) and then return to branches before hibernation (David'yan 2009).

Parthenolecanium corni has one generation per year in the northern part of its distribution, with two to three generations per year in the Southern European region, Transcaucasia and Central Asia (David'yan 2009). In California, there is usually only one generation per year on grape (Phillips 1992), however, in the north coast, a portion of the second instar develops into adult females that produce a second generation. These females develop on leaf veins, petioles, current season shoots, bunch stems or berries (Varela *et al.* 2013). Crawlers of the second generation may be found on petioles, leaves and shoot (Varela *et al.* 2013).

Parthenolecanium corni is highly polyphagous, attacking some 350 plant species in 40 families (Ben-Dov *et al.* 2012). *Parthenolecanium corni* occurs in Japan (JSAE 1987; Tadauchi and Inoue 2006; Ben-Dov *et al.* 2012).

Parthenolecanium corni is among the many scales that cause major problems in agricultural and ornamental ecosystems and are commonly transported on plant materials (CABI 2012).

Parthenolecanium corni is also known to cause considerable damage to commercial crops (Suter 1950). Due to their small size and habit of feeding in concealed areas, scales are frequently an invasive species causing billions of dollars in damage annually in the USA (Miller *et al.* 2007). Similar to other *Parthenolecanium* species, *P. corni* produce honeydew as they feed (Bentley *et al.* 2009; CABI 2012). Sooty mould may grow on the honeydew, producing blackened areas on leaves and fruit (Bentley *et al.* 2009). Ants may also be observed feeding on honeydew. When soft scales occur in abundance, they may stunt vine growth (David'yan 2009).

Parthenolecanium corni is mainly found on leaves, branches and trunks, and to a lesser degree on fruits of its hosts (David'yan 2009). On grapevine, *P. corni* adult females are mostly found on one to three year old wood under the bark on the underside of woody canes, cordons, and spurs, where they remain for the rest of their lives (Varela *et al.* 2013).

The risk scenario of concern for *P. corni* is that imported bunches of table grapes may contain nymphs and adult females.

Parthenolecanium corni was included in the existing import policy for table grapes from Chile (Biosecurity Australia 2005), China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and from California to WA (DAFF 2013). The assessment of *P. corni* presented here builds on these existing policies.

The probability of importation for *Parthenolecanium corni* was rated as ‘high’ in the assessment for table grapes from Chile (Biosecurity Australia 2005), China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b), and as ‘moderate’ in the assessment for table grapes from California to WA (DAFF 2013).

The probability of distribution for *Parthenolecanium corni* was rated as ‘low’ in the assessment for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and California (DAFF 2013). The probability of distribution after arrival in Western Australia of *Parthenolecanium corni* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Western Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Western Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *Parthenolecanium corni* will be imported into Western Australia with table grapes from Japan.

4.7.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Parthenolecanium corni* will arrive in Western Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Parthenolecanium corni* is reported on grapevine in Japan (MAFF 1989b) and is present on the islands of Hokkaido, Honshu and Shikoku (Tadauchi and Inoue 2006).
- Crawlers hatch from the eggs during early summer, migrate to the shoots and leaves to feed (Bentley *et al.* 2009) and then return to branches before hibernation (David'yan 2009).
- Once the first instars or crawlers settle on a suitable host such as grapevine, subsequent nymphs and adult females inside the scale covers remain sessile and attached to their host (David'yan 2009; Bentley *et al.* 2009).
- *Parthenolecanium corni* is a pest of several trees, shrubs and herbs and is mainly found on leaves, branches, trunks, and, to a lesser extent, fruits of its hosts (David'yan 2009).
- On grapevine, *P. corni* adult females are mostly found on one to three year old wood under the bark on the underside of woody canes, cordons, and spurs, where they remain for the rest of their lives (Varela *et al.* 2013).
- In California, a portion of the second instar population in the northcoast develops into adult females that produce a second generation. These females develop on leaf veins, petioles, current season shoots, bunch stems or berries (Varela *et al.* 2013).
- Information for *P. corni* in Japan with regards to the number of generations or parts of grapevines affected could not be found. There is a possibility that a second generation could occur in Japan.
- The small size *of P. corni* adult females (David'yan 2009) may make them difficult to detect, especially at low population levels. If present on grape bunches, sorting, grading and packing processes may not remove them effectively from the export pathway.
- However, *P. corni* produces honeydew as they feed (Bentley *et al.* 2009; CABI 2012) and sooty mould may grow on the honeydew, producing blackened areas on infested tissues (Bentley *et al.* 2009). Sooty mould, if present, is easily detected and infested grapes with sooty mould are likely to be discarded at harvest or during sorting and packing procedures.
- It is expected that the intensive production and quality inspection system practiced in Japan, as outlined in chapter 3 and key aspects emphasised in the introduction to this chapter, could reduce the presence of *P. corni* on grape bunches for export.
- *Parthenolecanium corni* overwinters as second instar nymphs (Bentley *et al.* 2009), suggesting a potential ability of the pest to tolerate cold storage and transportation.

The small size, sessile nature of second instar nymphs and adult females once on its host tissues and potential cold tolerance of this species, moderated by the information that this species is mainly associated with shoots and wood and not grape bunches, infested grape bunches are likely to be removed from the pathway due to the potential presence of visible sooty mould and the intensive production and quality inspection system practiced in Japan, supports a likelihood estimate for importation of ‘moderate’.

Probability of distribution

As indicated above, the probability of distribution for *P. corni* assessed here would be the same as that for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and California (DAFF 2013), that is **Low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *P. corni* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.7.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *P. corni* assessed here would be the same as that for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and California (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**Moderate**

4.7.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *P. corni* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Low**.

4.7.4 Consequences

The consequences of the establishment of *P. corni* in Western Australia have been estimated previously for table grapes from Chile (Biosecurity Australia 2005), and were adopted for table grapes from China (Biosecurity Australia 2011a), Korea (Biosecurity Australia 2011b) and California (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**D**
Other aspects of the environment	**B**
Eradication, control	**D**
Domestic trade	**C**
International trade	**C**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for *P. corni* are estimated to be: **Low**.

4.7.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Parthenolecanium corni*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Low**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for *P. corni* has been assessed as 'very low', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.8 Leafrollers

Eupoecilia ambiguella[EP] *and Sparganothis pilleriana*[EP]

Eupoecilia ambiguella (grape berry moth) and *Sparganothis pilleriana* (leaf rolling tortrix) belong to the Tortricinae subfamily within the family Tortricidae. These species have been grouped together because of their related biology and taxonomy, and are predicted to pose a similar risk and to require similar mitigation measures. In this assessment, the term 'leafroller' is used to refer to both species. The scientific name is used when the information is about a specific species.

Eupoecilia ambiguella is a known pest of grapevines in the former Union of Soviet Socialist Republics (Frolov 2009a), Germany (Ibrahim 2004) and Japan (JSAE 1987). It is also known from Western Europe (northward to Finland and westward to southeast England and southern Wales), Asia Minor, Iran, China and Korea (Frolov 2009a).

There are two generations of *E. ambiguella* per year although a third generation is reported in Central Asia (Frolov 2009a). First generation adult moths emerge from over-wintering pupae at variable dates depending on the region and weather conditions (INRA 1997a). The egg-laying period of the first generation moths usually coincides with the inflorescence stage of grapevine (Frolov 2009a). First generation moths lay eggs on flower buds (INRA 1997a; Frolov 2009a), bracts, petals and stems of the flower clusters (Roehrich and Boller 1991). First generation *E. ambiguella* larvae feed on grape buds and flowers, covering them with webbing, which can lead to the complete destruction of the buds (Frolov 2009a). Mature larvae of the first generation pupate mainly on the edges of the leaves (Roehrich and Boller 1991) or in leaf folds (INRA 1997a).

Second generation moths emerge after 14 days as pupae (INRA 1997a). The second flight takes place 2–2.5 months after the first flight (INRA 1997a). They lay second generation eggs on berries (Roehrich and Boller 1991; INRA 1997a; Frolov 2009a). Emerging larvae gnaw round holes and bore into unripe berries, feeding on the grape pulp and immature seeds before the seeds harden (Frolov 2009a). One larva may damage 9–17 berries and the residues of damaged berries dry up (Frolov 2009a). Damaged berries are also prone to infection by the fungus *Botrytis cinerea* which develop readily on damaged berries (Meijerman and Ulenberg 2000b). Larvae of the second generation leave the fruit clusters to pupate in the bark of the trunks (Roehrich and Boller 1991).

Known hosts of *E. ambiguella* include grapes, buckthorn, viburnum, ivy, lilac, honeysuckle, Cornelian cherries, maple (Frolov 2009a), black currant, yellow bedstraw, privet and ash (INRA 1997a). However, second generation larvae seem rare on hosts other than grapes (Roehrich and Boller 1991).

Sparganothis pilleriana has a wide distribution extending from north-western Europe (Sweden) south to the Middle East (Iran and Iraq) and east through the Caucasus and central Asia (including China, the Korean Peninsula and Japan) to the Kamchatka peninsula (Russian Federation) and North and Central America (Frolov 2009b).

There is generally one generation of *S. pilleriana* per year (INRA 2005; Frolov 2009b), but in Transcaucasia two generations per year sometimes occur (Frolov 2009b). Eggs of *S. pilleriana* are laid on the upper surface of the leaves (INRA 2005). The first instar larvae usually do not eat after hatching, but overwinter in thin but dense silky cocoons inside bark crevices, on plant residues, or in the top 10 centimetres of surface soil (Frolov 2009b). Larvae resume their activity when the first leaves appear in the following spring (Roehrich and Boller 1991). Time required for development depends largely on temperature, with eggs developing in 9–20 days, larvae (after overwintering) in 30–50 days, pupae in 10–15 days. The life span of the adult is up to 22 days; average fecundity is 200–250 eggs (with a maximum of 450) (Frolov 2009b).

Pupation of *S. pilleriana* occurs in the rolled leaves of host plants (Meijerman and Ulenberg 2000c; INRA 2005), between spun leaves (Meijerman and Ulenberg 2000c), or between leaves or fruits (Frolov 2009b).

Sparganothis pilleriana is a polyphagous species capable of developing on more than 100 species of cultivated and wild host plants from 30 families, including grape (Carter 1984; Meijerman and Ulenberg 2000c; INRA 2005; Frolov 2009b). Upon resuming their activity after overwintering, *S. pilleriana* larvae have been reported to feed on buds, leaves, stems and flower clusters (Roehrich and Boller 1991; INRA 2005). However, there have also been reports of *S. pilleriana* larvae feeding on fruit of its hosts. Carter (1984) reported that the larvae feed on buds and developing leaves in spring and on fruit and foliage in autumn; and Schmidt-Tiedemann *et al*. (2001) reported that they are capable of causing economic damage by attacking shoot tips, leaves, inflorescences and grape bunches.

The risk scenario of concern for these leafrollers is that larvae and pupae (for *S. pilleriana*) may potentially be present in imported grape bunches.

Eupoecilia ambiguella and *Sparganothis pilleriana* were included in the existing import policy for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The assessment presented here builds on these existing policies.

The probability of importation for leafrollers was rated as ‘low’ in the assessment for table grapes from China (Biosecurity Australia 2011a) and as ‘moderate’ in the assessment for table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for leafrollers was rated as ‘moderate’ in the assessment for table grapes from China (Biosecurity Australia 2011a) and was adopted for table grapes from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of leafrollers will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences they may cause will be the same for any commodity with which these species are imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that leafrollers will be imported into Australia with table grapes from Japan.

4.8.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that leafrollers will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Eupoecilia ambiguella* is present in Japan on all four main islands (Hokkaido, Honshu, Shikoku and Kyushu) as well as on some small islands including Tsushima, Yakushima, Amami-Oshima, and Okinawa-Honto (Tadauchi and Inoue 2006). This species is identified as one of the major pests of commercial crops, including grapevine in Japan (JSAE 1987).
- *Eupoecilia ambiguella* eggs are laid on or near the larval food source. The first generation moths lay eggs on flower buds (INRA 1997a; Frolov 2009a), bracts, petals and stems of the flower clusters (Roehrich and Boller 1991); and the second generation moths on berries (Roehrich and Boller 1991; INRA 1997a; Frolov 2009a).
- First generation *E. ambiguella* larvae feed on grape buds and flowers, while second generation larvae feed on pulp and unripe seeds before they harden and the residues of damaged berries dry up (Frolov 2009a). Damaged berries are also prone to infection by the fungus *Botrytis cinerea* which develop readily on damaged berries (Meijerman and Ulenberg 2000b).
- Damaged grapes by *E. ambiguella* second generation larvae are unlikely to develop to full maturity and are likely to be detected and removed during harvesting and packing processes due to obvious feeding damage.
- Larvae of the second generation leave the fruit clusters to pupate in the bark of the trunks (Roehrich and Boller 1991).
- *Sparganothis pilleriana* is present in Japan on the islands of Hokkaido, Honshu and Shikoku (Tadauchi and Inoue 2006). Although this species is considered a pest of grapevine in Europe (Carter 1984; Schmidt-Tiedemann *et al.* 2001), Transcaucasia and far east Russia (Frolov 2009b), there have been no records that associate this species with grapevines in Japan.
- *Sparganothis pilleriana* eggs are laid on the upper surface of the leaves (INRA 2005). Once hatched, the first instar larvae usually do not eat, but overwinter inside bark crevices, on plant residues, or in the top 10 centimetres of surface soil (Frolov 2009b); and will resume their activity when the first leaves appear in the following spring (Roehrich and Boller 1991).
- After overwintering, *S. pilleriana* larvae feed on buds, leaves, stems and flower clusters (Roehrich and Boller 1991; INRA 2005). However, Carter (1984) reported that while the larvae feed on buds and developing leaves in spring, they feed on fruit and foliage in autumn. Schmidt-Tiedemann *et al*. (2001) reported that they are capable of causing economic damage by attacking shoot tips, leaves, inflorescences and grape bunches.
- Pupation of *S. pilleriana* has been reported to occur in the rolled leaves of host plants (Meijerman and Ulenberg 2000c; INRA 2005), between spun leaves (Meijerman and Ulenberg 2000c), or between leaves or fruits (Frolov 2009b).
- Larvae of *S. pilleriana* have been reported to pupate towards mid June and the flights occur from mid July to end July (INRA 2005). However, Meijerman and Ulenberger (2000c) reported that in the UK and the Netherlands, flights occur in July and August.

Development time for each life stage of *S. pilleriana* depends on temperature (Frolov 2009b) and hence timeline for pupation and emergence of adults may vary between regions.

- In Japan, *S. pilleriana* flights occur during June and July (Meijerman and Ulenberg 2000c).
- Harvesting of grapes in Japan begins in late July or early August for early cultivars, followed by mid-season cultivars in late August and October, and ending in late December for late cultivars (Morinaga 2001). However, some grapes could be harvested as early as June (MAFF 2013e). It is likely that emergence of most adults occurs before grape harvest. While some pupae may potentially remain in grape bunches of early cultivars at the time of harvest, they are likely to be detected and removed from the pathway.
- Adult leafrollers are mainly active at night through to early morning (Meijerman and Ulenberg 2000b; Meijerman and Ulenberg 2000c). They are easily disturbed and are unlikely to remain on the fruit during picking, sorting and packing, but fly away.

The potential association of larvae of *E. ambiguella* or for larvae and pupae of *S. pilleriana* with grape bunches, moderated by infested fruit are likely to be removed from the pathway due to the conspicuous nature of fruit damage, emergence of most adults occur before grape harvest and any pupae remaining in grape bunches of early cultivars are likely to be detected and removed from the pathway, support a likelihood estimate for importation of ‘low’.

Probability of distribution

As indicated above, the probability of distribution for leafrollers assessed here would be the same as that for leafrollers for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that leafrollers will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.8.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for leafrollers assessed here would be the same as that for leafrollers for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.8.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that leafrollers will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.8.4 Consequences

The consequences of the establishment of leafrollers in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a), and were adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**D**
Eradication, control	**E**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for leafrollers are estimated to be: **Moderate**.

4.8.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Eupoecilia ambiguella* and *Sparganothis pilleriana*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *Eupoecilia ambiguella* and *Sparganothis pilleriana* has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for these pests.

4.9 Plume moths

Nippoptilia vitis[EP] *and Platyptilia ignifera*

Nippoptilia vitis and *Platyptilia ignifera* both belong to the Pterophoridae or plume moth family. These two plume moth species have been grouped together because of their related biology and taxonomy, and are predicted to pose a similar risk and to require similar mitigation measures. In this assessment, the term 'plume moths' will be used to refer to both species. The scientific name is used when the information is about a specific species.

The genera *Nippoptilia* and *Platyptilia* are closely related, with member species having similar physiology and life histories (Yano 1963b). Plume moths have four life stages: egg, larva, pupa and adult (Yano 1963b). *Nippoptilia vitis* adults are 9–10 millimetres long with a wingspan of 17–19 millimetres (BAIRC 2007). *Platyptilia ignifera* adults have a forewing length of 9–10 millimetres (Yano 1963b) and a wingspan of 20 millimetres (MAFF 1995).

Nippoptilia vitis adults overwinter in grasses, cracks in the soil, or within dead branches or leaf folds and can live from 2–12 days after overwintering, but most of them live 3–4 days. They are active at night and this is when females lay eggs (BAIRC 2007). Each female lays 39–98 eggs with an average of 71 eggs (BAIRC 2007). Eggs are laid individually and located separately. Eggs are ovoid and 0.8 millimetres in diameter (Li 2004; BAIRC 2007). The full lifespan of this pest is unknown.

Nippoptilia vitis larvae bore into the fruit from the stem end, feeding on the pulp and seed, usually causing the damaged fruit to drop after three to five days (BAIRC 2007). Any fruit which remains on the bunch is abnormally shaped and shows visible larval exit holes (Li 2004). In Japan, the adults are active in June, August and September (MAFF 2008a) and lay eggs on pedicels within grape bunches (MAFF 1995). The larvae pupate on leaves or on fruit (MAFF 1995).

Platyptilia ignifera larvae can grow up to 20 millimetres long, while pupae are 13–15 millimetres long (Yano 1979). *Platyptilia ignifera* larvae have been observed feeding in large numbers on grape berries (Yano 1979). Damage is particularly serious against young grape berries (MAFF 1995). The larvae can damage over 23 per cent of berries in infested vineyards, or over 39 per cent if the vineyard is protected from rain (Asano and Kamio 2003). There is very little information relating to the biology of this species and its full lifespan is unknown.

The risk scenario of concern for plume moths is that eggs, larvae and pupae may be present in imported grape bunches.

Nippoptilia vitis was included in the existing import policies for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The assessment of plume moths presented here builds on these existing policies.

The probability of importation for *Nippoptilia vitis* was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b).

The probability of distribution for *Nippoptilia vitis* was rated as 'low' in the assessment for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia

2011b). The probability of distribution after arrival in Australia of *Nippoptilia vitis* and *Platyptilia ignifera* for table grapes from Japan will not differ from that of *Nippoptilia vitis* for table grapes from China. The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that plume moths will be imported into Australia with table grapes from Japan.

4.9.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that plume moths will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- Both *Nippoptilia vitis* and *Platyptilia ignifera* are associated with grapes in Japan (Yano 1963b; MAFF 2008a). *Nippoptilia vitis* is recorded from Honshu, Shikoku and Kyushu, while *P. ignifera* is recorded from Honshu and Kyushu (Tadauchi and Inoue 2006; MAFF 2008a).
- *Nippoptilia vitis* eggs can be laid onto the pedicels of grapes (MAFF 1995). In Japan, the adults are active in June, August and September (MAFF 2008a), hence it is possible that eggs of *N. vitis* could be present in bunches during the harvest of early and mid-season cultivars.
- In China, larvae of *N. vitis* can feed in grape bunches from early July to mid September (BAIRC 2007). Larvae bore into young grapes, mainly from the stem end but some enter around the calyx end. Frass is extruded from the infested grapes and damaged grapes shrink and eventually fall off the bunch in three to five days (BAIRC 2007). Larvae of the assessed plume moths are of large size. If they remain on grape bunches at harvest, they are likely to be detected and removed during harvesting or packing processes. One larva can damage over ten berries. Grape bunches with several berries missing are unlikely to be picked or packed for export.
- Pupae may be present in the harvested grape bunches, as larvae tend to pupate on grape stalks within the grape bunch (Yano 1979; Li 2004; BAIRC 2007), on leaves or on the fruit itself (MAFF 1995). Pupae of *N. vitis* are 8 millimetres long and 1.5 millimetres wide (Yano 1963b) and those of *P. ignifera* are 13–15 millimetres long and 2.7–3 millimetres wide (Yano 1979). Pupae remaining on grape bunches are likely to be detected due to their large size. Pupae that attached to stalks hidden among the berries may escape detection, however, this is unlikely because damaged grape bunches would have several berries missing (dropped off or removed during harvesting or packing processes) and hence expose any remaining pupae. Also, damaged grape bunches with several berries dropped off or removed are unlikely to be packed for export.
- Information on survival of pupae in storage and transport conditions could not be found. Adult moths are the overwintering stage for *N. vitis* (BAIRC 2007).

The association of eggs, larvae and pupae with grape bunches, moderated by the fact that bunches affected by these species are likely to be culled during harvesting or packing processes due to their large sizes and the obvious signs of damage they cause, supports a likelihood estimate for importation of 'low'.

Probability of distribution

As indicated above, the probability of distribution for plume moths assessed here would be the same as that for *Nippoptilia vitis* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **Low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that plume moths will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.9.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for plume moths assessed here would be the same as that for *Nippoptilia vitis* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **Low**

Probability of spread: **Low**

4.9.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that plume moths will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Very low**.

4.9.4 Consequences

The consequences of the establishment of *Nippoptilia vitis* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**D**
Other aspects of the environment	**A**
Eradication, control	**B**

Domestic trade	**C**
International trade	**C**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for plume moths are estimated to be: **Low**.

4.9.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Nippoptilia vitis* and *Platyptilia ignifera*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for plume moths has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for these pests.

4.10 Apple heliodinid

Stathmopoda auriferella[EP]

Stathmopoda auriferella belongs to the family Oecophoridae and is commonly known as the apple heliodinid. This species is present in Japan (MAFF 1989b; Tadauchi and Inoue 2006), as well as in other regions, for example West Africa (ICRISAT 1985), Egypt (Badr *et al.* 1983), China (Shanghai Insects Online 2010) and Korea (NPQS 2007b).

Stathmopoda auriferella has four life stages: egg, larva, pupa and adult. This species appears to have two generations per year (MAFF 1989b; Park *et al.* 1994).

Stathmopoda auriferella infests flowers, fruit and leaves of multiple host plants including grapevine (Badr *et al.* 1983); (JSAE 1987; MAFF 1989b). Other host plants of this species include mango, orange, apple, jujube, pomegranate, sunflower, avocado, mango, mandarin, peach and kiwifruit (Badr *et al.* 1983; Park *et al.* 1994; Yamazaki and Sugiura 2003).

The risk scenario of concern for *Stathmopoda auriferella* is that larvae may be present in imported grape bunches.

Stathmopoda auriferella was included in the final import policy for unshu mandarin from Japan (Biosecurity Australia 2009) and table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The assessment of *S. auriferella* presented here builds on these existing policies.

The probability of importation for *S. auriferella* was rated as 'moderate' in the assessment for unshu mandarin from Japan (Biosecurity Australia 2009), 'low' in the assessment for table grapes from China (Biosecurity Australia 2011a) and 'moderate' in the assessment for table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *S. auriferella* was rated as 'high' in the assessment for unshu mandarin from Japan (Biosecurity Australia 2009). Due to the differences in fruit morphology between unshu mandarins and table grapes, probability of distribution was re-assessed, but was still rated as 'high', for table grapes from China (Biosecurity Australia 2011a) and this rating was adopted for table grapes from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of *S. auriferella* for table grapes from Japan will not differ from that for table grapes from China or Korea. The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climatic conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *S. auriferella* will be imported into Australia with table grapes from Japan.

4.10.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Stathmopoda auriferella* will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Stathmopoda auriferella* is identified as a pest of grapevine in Japan (JSAE 1987; MAFF 1989b). It is recorded from the main islands of Honshu, Shikoku, Kyushu and several southwestern islands including Okinawa (MAFF 1989b; Tadauchi and Inoue 2006).
- Adult *Stathmopoda* moths are winged and capable of flight (Badr *et al.* 1983), but are unlikely to stay on the fruit during picking, sorting and packing.
- *Stathmopoda auriferella* larvae are 9.8 millimetres long on average when mature. The larvae have a habit of concealing themselves by boring into host tissue (ICRISAT 1985; Yamazaki and Sugiura 2003). However, on fruit they feed predominantly on the fruit surface (Park *et al.* 1994). Larvae feeding externally on berries are likely to be detected and removed during harvesting and packing procedures.
- There is, however, a report of some larvae burrowing into green berries, which may split, shrivel, or fall off when damaged (USDA-APHIS 2004).
- In Korea, *S. auriferella* larvae produce webbing on the flower buds and newly-set grape berries, often causing the affected parts to drop from the grapevine. While the majority of *S. auriferella* larvae feed on the fruit surface, some larvae (about 10 per cent) have been recorded feeding from the fruit stalk on kiwifruit (Park *et al.* 1994) and the calyx end of pomegranate (Heckford 2013), which can be difficult to observe.
- There has been no report of *S. auriferella* larvae associated with the pedicel on grape bunches.
- Packed grapes are transported in cold humidified storage to ensure grape quality is maintained. It is unknown if *S. auriferella* will survive in table grapes under routine commercial conditions during cold storage and transport. However, the last larval instar of *S. auriferella* is identified as the overwintering stage (MAFF 1989b). This suggests that larvae may be capable of surviving cold storage and transport.

The potential presence of larvae on grape bunches and its potential ability to survive cold storage and transport, moderated by the fact that the majority of *S. auriferella* feed on the fruit surface, most infested fruit either fall off from the bunches or show obvious damage and hence will not be on the export pathway, support a likelihood estimate for importation of 'low'.

Probability of distribution

As indicated above, the probability of distribution for *S. auriferella* assessed here would be the same as that for *S. auriferella* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **High**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *S. auriferella* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.10.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *S. auriferella* assessed here would be the same as that for *S. auriferella* for unshu mandarins from Japan (Biosecurity Australia 2009), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.10.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *S. auriferella* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.10.4 Consequences

The consequences of the establishment of *S. auriferella* in Australia have been estimated previously for unshu mandarins from Japan (Biosecurity Australia 2009), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**B**
Eradication, control	**C**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for *S. auriferella* are estimated to be: **Low**.

4.10.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Stathmopoda auriferella*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Low**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for *Stathmopoda auriferella* has been assessed as 'very low' which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.11 Kanzawa spider mite

Tetranychus kanzawai[EP, WA]

Tetranychus kanzawai is a member of the spider mite family, Tetranychidae (Migeon and Dorkeld 2012). *Tetranychus kanzawai* has been recorded in parts of Australia (Gutierrez and Schicha 1983) but has not been recorded in Western Australia (WA) (DAWA 2006a) and is a pest of regional quarantine concern for that state.

Mites of the genus *Tetranychus* are commonly referred to as spider mites due to their habit of spinning silken webbing on plants. These mites feed mainly on the contents of leaf cells, (Zhang 2008) but are known to attack all host tissues exposed to air during heavy infestations (Jeppson *et al.* 1975) and can sometimes damage fruit (Tomczyk and Kropczynska 1985). This disrupts a plant's ability to photosynthesise and consequently reduces the vitality of the plant and therefore the size of the fruit (Berry 1998).

There are five stages in the spider mite life cycle: egg, larva, two stages of nymph (protonymph and deutonymph), and adult (Zhang 2008). Adult spider mites are very small, with females measuring 0.3–0.5 millimetres in length and males being even smaller (Zhang 2008; CABI 2012). A complete life cycle of spider mites can be completed in less than one week (in optimum conditions) and up to several weeks (Potter and Potter 2013), with many overlapping generations in a single season (Zhang 2008; Potter and Potter 2013).

For *T. kanzawai*, female adults can lay up to 20–25 eggs per day (Banerjee and Cranham 1985), which are deposited directly on the host leaf (Zhang 2003; Zhang 2008). The development time from egg to adult has been reported as 19, 16 and 12 days at 20, 22 and 25 °C, respectively (Zhang 2003). The reported life span is 20–33 days for adult females and 19–35 days for adult males at 15–30 °C (Zhang 2003). Optimum conditions for development have been reported in the range of 20–25 °C and 30–90 per cent relative humidity (Banerjee and Cranham 1985).

All *Tetranychus* species are capable of both sexual reproduction and parthenogenesis, with unfertilised females producing only male offspring (Helle and Pijnacker 1985).

Tetranychus kanzawai is widely distributed in Japan and has been reported from all four main islands, Hokkaido, Honshu, Kyushu and Shikoku, (CABI 2012) as well as from Sakishima (Ohno *et al.* 2009), Tanegashima (Takafuji *et al.* 2001), and Yakushima (Takafuji *et al.* 2001). Generally, *T. kanzawai* is regarded as a serious pest on a variety of agricultural and ornamental crops (Ehara 1963; Bolland *et al.* 1998; Gotoh and Gomi 2000; Zhang 2003). In Japan, it has been identified as a major pest of many cultivated and wild plants (Ehara and Masaki 1989; Ohno *et al.* 2009), including grapes (Ehara 1966; Ashihara 1995; Zhang 2003; MAFF 2008a).

While principally found on the leaves of host plants, spider mites may spread to other plant parts including fruit, particularly if population densities are high (Jeppson *et al.* 1975).

The risk scenario of concern for *T. kanzawai* is the presence of eggs, juvenile (nymphal) or adult *T. kanzawai* on imported grape bunches.

Tetranychus kanzawai was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The assessment of *T. kanzawai* presented here builds on these existing policies.

The probability of importation for *T. kanzawai* was rated as 'moderate' in the assessment for table grapes from Korea (Biosecurity Australia 2011b) and 'high' in the assessment for table grapes from China (Biosecurity Australia 2011a).

The probability of distribution for *T. kanzawai* was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of the assessed species will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *T. kanzawai* will be imported into WA with table grapes from Japan.

4.11.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *T. kanzawai* will arrive in WA with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- *Tetranychus kanzawai* is widely distributed in Japan and has been recorded in all four main islands, Hokkaido, Honshu, Kyushu and Shikoku (CABI 2012), as well as in Sakishima (Ohno *et al.* 2009), Tanegashima (Takafuji *et al.* 2001) and Yakushima (Takafuji *et al.* 2001). It is a major pest of many cultivated and wild plants in Japan (Ehara and Masaki 1989; Ohno *et al.* 2009) including grapes (Ehara 1966; Ashihara 1995; Zhang 2003; MAFF 2008a).
- In Japan, Ashihara (1995) and Zhang (Zhang 2003) regarded this mite species as a pest of grapes in greenhouses. *Tetranychus kanzawai* population density can vary considerably between grape cultivars in greenhouses, showing high developmental success on some cultivars (Ashihara 1996).
- Spider mites feed mainly on leaves (Zhang 2008) but are known to attack all host tissues exposed to air during heavy infestations (Jeppson *et al.* 1975) and can sometimes damage fruit (Tomczyk and Kropczynska 1985). There are reports of *T. kanzawai* attacking grape berries in addition to leaves in Japan (Ashihara 1995; MAFF 2008a).
- The small size (female adults are only 0.3–0.5 millimetres in length and males are even smaller) (Zhang 2008; CABI 2012) of spider mites and the possibility of low levels of infestation make it possible that some mites may escape detection during harvesting or packing processes. However, at low levels of infestation, *T. kanzawai* may only feed on leaves and not fruit.

- *Tetranychus kanzawai* has been recorded overwintering as adult females (Veerman 1985). A preliminary study on *T. kanzawai* showed adults could survive up to 10 days at –1 °C to –5 °C (Yang *et al.* 1991). This suggests that they may be able to survive under cold storage and transport.
- *Tetranychus* species are regularly intercepted on horticultural commodities at the border in Australia, New Zealand and other countries (Brake *et al.* 2003; MAF Biosecurity New Zealand 2009c).

The association of *T. kanzawai* with grapes in Japan, its potential ability to survive standard grading, transport and cold storage, and historical interception rates of spider mites supports a likelihood estimate for importation of **High**.

Probability of distribution

As indicated above, the probability of distribution for *T. kanzawai* in Western Australia assessed here would be the same as that for *T. kanzawai* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *T. kanzawai* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Moderate**.

4.11.2 Probability of establishment and of spread

The probability of establishment and of spread for *T. kanzawai* would be the same as that for *T. kanzawai* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**Moderate**

4.11.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *T. kanzawai* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Low.**

4.11.4 Consequences

The consequences of the establishment of *T. kanzawai* in Western Australia have been estimated previously for *T. kanzawai* for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact score is provided below:

Plant life or health	**E**
Other aspects of the environment	**B**
Eradication, control	**D**
Domestic trade	**C**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for this spider mite are estimated to be: **Moderate**.

4.11.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Tetranychus kanzawai*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *Tetranychus kanzawai* has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.12 Thrips

Drepanothrips reuteri[EP], *Frankliniella occidentalis*[EP, NT]

The thrips species assessed here have been grouped together because of their related biology and taxonomy, and they are predicted to pose a similar risk. Unless explicitly stated, the information presented is considered as applicable to both species. In this section, the term 'thrips' is used to refer to both species. The scientific name is used when the information is about a specific species.

Drepanothrips reuteri (grape thrips) is absent from Australia and is a pest of quarantine concern for all Australia. *Frankliniella occidentalis* (western flower thrips) is not known to be present in the Northern Territory and is a pest of regional quarantine concern for this territory. *Frankliniella occidentalis* is also a known vector of several viruses, some of which are of quarantine concern to Australia.

Thrips can reproduce both sexually and asexually (Jensen *et al.* 1992), with unmated females producing only males (Roques 2006).

Thrips have four main life stages: egg, nymph, pupa and adult (Roques 2006). Adults are very small and are easily overlooked. They are commonly found feeding on leaves, stems, flowers and fruit of grapevines (Roques 2006; Roditakis and Roditakis 2007). Eggs are laid on leaves, flower tissue and fruits (Roques 2006). Eggs hatch into nymphs, which are found on leaves, buds, flowers and fruits. Thrips are present throughout the year and their life cycle and development is dependent on optimum temperature and relative humidity conditions (Mau and Martin Kessing 1993). The overall life cycle for *F. occidentalis* lasts from 44.1 days at 15 °C to 15 days at 30 °C (Roques 2006). Roditakis and Roditakis (2007) report that, in the laboratory, *F. occidentalis* took 10 days to develop from nymph to adult on ripe grape berries at 25 °C.

Both *D. reuteri* and *F. occidentalis* are known to create scars on grape berries by feeding on the skin or by inserting eggs into the fruit (Bentley *et al.* 2009). *Frankliniella occidentalis* is an important pest species due to the significant cosmetic damage it causes feeding on developing flowers, leaves and fruit of grapes and a number of commercial and wild host plants (Roditakis and Roditakis 2007). In general, thrips, are a minor problem on wine and raisin grapes, however, table grapes are susceptible to thrips damage (Bentley *et al.* 2009). Thrips mouthparts are used to rupture and suck sap from plant cells, causing silvering effect on leaves or a corky layer on fruit that can reduce crop yield, productivity and marketability (Mau and Martin Kessing 1993; Kulkarni *et al.* 2007). They can also transmit pathogens while feeding (Roques 2006; Roditakis and Roditakis 2007).

Frankliniella occidentalis is a vector of several tospoviruses (Morse and Hoddle 2006). Among the tospoviruses that can be vectored by *F. occidentalis*, tomato spotted wilt virus (TSWV), Chrysanthemum stem necrosis virus (CSNV), Groundnut ringspot virus (GRSV) and Impatiens necrotic spot virus (INSV) are present in Japan (NIAS 2012). Of these, CSNV, GRSV and INSV are not present in Australia. Tospoviruses are persistently transmitted by *F. occidentalis*, that is once a *F. occidentalis* nymph has acquired the virus it remains infective for life (Jones 2005; Persley *et al.* 2006). Tospoviruses are not passed on to the next generation.

The risk scenario of concern for thrips is that eggs, nymphs and adults may be present in table grape bunches.

The risk scenario of concern for CSNV, GRSV and INSV is the presence of any of these viruses in *F. occidentalis* on imported grape bunches. Grapes do not appear to be a host of these viruses. However, *F. occidentalis* that has acquired these viruses from other host plants may subsequently have moved to grapes. The introduction of these viruses would depend on the entry of *F. occidentalis*. Establishment and spread of these viruses in Australia may rely on the existing population of *F. occidentalis* in Australia, and this probability could be 'high', given the widespread distribution of the vector and a related tospovirus, Tomato spotted wilt virus (TSWV).

This risk assessment considers the risk associated with *D. reuteri* (for all of Australia) and *F. occidentalis* (for the Northern Territory). The Australian Department of Agriculture is undertaking the risk analysis of viruses being introduced by *F. occidentalis*, including CSNV, GRSV and INSV, on all commodity and country pathways. When completed, the relevant outcomes of that analysis will also be adopted for table grapes from Japan.

Drepanothrips reuteri was included in the existing import policy for table grapes from Chile (Biosecurity Australia 2005). *Frankliniela occidentalis* was included in the existing import policy for table grapes from Chile, (Biosecurity Australia 2005), China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b) and unshu mandarins from Japan (Biosecurity Australia 2009). The assessment of thrips presented here builds on these existing policies.

The probability of importation for *D. reuteri* and *F. occidentalis* was rated as 'low' in the assessment for table grapes from Chile, (Biosecurity Australia 2005). The probability of importation for *F. occidentalis* was rated as 'high' in the assessment for unshu mandarin from Japan (Biosecurity Australia 2009) and table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b).

The probability of distribution for thrips was rated as 'moderate' in the assessment for table grapes from Chile (Biosecurity Australia 2005) and China (Biosecurity Australia 2011a). The probability of distribution after arrival in Australia of thrips will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *D. reuteri* and *F. occidentalis* will be imported into Australia with table grapes from Japan.

4.12.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that thrips will arrive in Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- *Drepanothrips reuteri* is present in Japan on the island of Honshu (Tadauchi and Inoue 2006). *Frankliniella occidentalis* is present on the islands of Hokkaido, Honshu and Kyushu (CABI 2013).
- *Drepanothrips reuteri* and *F. occidentalis* feed on the fruit of ripened grape bunches (Roditakis and Roditakis 2007).
- Female *F. occidentalis* have a saw-like external ovipositor that is used to cut through the plant epidermis and deposit eggs into the tissues of the host plant (Mau and Martin Kessing 1993). Eggs can be laid directly into ripe grape berries (Roditakis and Roditakis 2007).
- Thrips prefer cryptic habitats, that is small crevices and tightly closed plant parts (Morse and Hoddle 2006). Adults and immature forms may hide within bunches (that is in crevices on fruit stems).
- Thrips can scar berries with their feeding, which renders certain varieties unmarketable (Bentley *et al.* 2009). Table grapes with such symptoms may be detected during harvesting and/or packing processes and will not be packed for export. However, red or black varieties of grapes are less likely to show visible damage as the scars can be obscured by the colour (Jensen *et al.* 1992), hence dark skin grapes with minor symptoms of thrips damage may escape detection.
- Both *D. reuteri* and *F. occidentalis* are capable of surviving at least 16 days with ripe grape berries as the only available food source (Roditakis and Roditakis 2007).
- Thrips have been recorded on produce entering the Netherlands from 30 different countries over a thirteen-year period (1980–1993), and approximately 1000 thrips specimens are intercepted by the US border inspectors annually (Morse and Hoddle 2006). Therefore, thrips appear to be capable of surviving packing house procedures, cold storage and transport conditions.
- *Drepanothrips reuteri* develops successfully in temperate parts of Europe and overwinter as adults (Alford 2007). This suggests that any *D. reuteri* adults in exported grape bunches would be capable of surviving the cold conditions used for transport.
- *Frankliniella occidentalis* is capable of surviving sub-zero temperatures and successfully reproducing once exposed to warmer climates (McDonald *et al.* 1997; CABI 2013).

The association of the assessed thrips species with grape berries, their small size and cryptic nature, their ability to adapt to varying environments and trade interception records, support a likelihood estimate for importation of 'high'.

Probability of distribution

As indicated above, the probability of distribution for thrips assessed here would be the same as that for thrips for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that thrips will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Moderate**.

4.12.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for thrips assessed here would be the same as that for thrips for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.12.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that thrips will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Moderate**.

4.12.4 Consequences

The consequences of the establishment of *F. occidentalis* in Australia have been estimated previously for unshu mandarin from Japan (Biosecurity Australia 2009) and were adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**D**
Other aspects of the environment	**B**
Eradication, control	**D**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for thrips are estimated to be: **Low**.

4.12.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Drepanothrips reuteri* and *Frankliniella occidentalis*	
Overall probability of entry, establishment and spread	**Moderate**
Consequences	**Low**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *Drepanothrips reuteri* and *Frankliniella occidentalis* has been assessed as ‘low’ which exceeds Australia’s ALOP. Therefore, specific risk management measures are required for these pests.

4.13 Bacterial blight

Xylophilus ampelinus

Xylophilus ampelinus is an aerobic, non-spore-forming, gram negative plant pathogenic bacterium that causes bacterial blight, a major bacterial disease of grapevine (Bradbury 1991; Szegedi and Civerolo 2011).

Bacterial blight of grapevine is a chronic, systemic disease that is of significant economic importance (Panagopoulos 1987). It affects commercially important cultivars in several grape-producing regions, including southern Europe, Turkey and South Africa (Panagopoulos 1987; Panagopoulos 1988). Bacterial blight has recently also been reported on grapevine on the island of Hokkaido, Japan (NIAS 2012; Hokkaido Plant Protection Office 2013).

Xylophilus ampelinus infects the vascular tissues of infected plants and causes shoot blights, cankers and occasionally leaf spots (Panagopoulos 1988; EPPO 2009c). On leaves, *X. ampelinus* causes local lesions when it infects through stomata or the entire leaf may die if infection occurs through the petiole (Szegedi and Civerolo 2011). The bacterium causes cracks and cankers on spurs, branches, young shoots, petioles and peduncles (Panagopoulos 1987). Symptoms can vary significantly depending on grapevine cultivars and possibly environmental conditions (Panagopoulos 1988).

Xylophilus ampelinus infects grapevines through wounds or natural openings (Szegedi and Civerolo 2011). Primary infections occur mainly on one to two-year old shoots through leaves, blossoms and bunches (CABI-EPPO 1997b). Leaves can be infected through drops of contaminated sap or through the petiole (EPPO 2009c). In late winter, the bacterium moves in xylem vessels and spreads to healthy branches and spurs, and later into new shoots and grape clusters (Panagopoulos 1988). Cankers developing on new growth provide inoculum for infection through stomata of leaves (during wet weather or overhead irrigation) (Panagopoulos 1988). Sap leaking from pruning wounds during vine sprouting provides inoculum for infection of emerging shoots, which are highly susceptible to infection (Panagopoulos 1988; Grall *et al.* 2005).

Xylophilus ampelinus survives in the vascular tissues of infected plants and cuttings (Panagopoulos 1987; Panagopoulos 1988). Throughout the seasons, the bacterium survives and multiplies in old wood (Grall *et al.* 2005).

The bacterium can be transmitted through pruning and grafting (Bradbury 1991). It spreads locally with moisture (rain or irrigation) to sites where infection can take place such as wounds or leaf scars (Panagopoulos 1987; Bradbury 1991; CABI-EPPO 1997b).

There are no known vectors of the bacterium (Szegedi and Civerolo 2011).

Distribution of the bacterium within the plant is irregular, varying during the year and between years (Grall *et al.* 2005; EPPO 2009c). An epiphytic lifestyle (the ability of a bacterium to survive and develop on the surface of leaves, fruit and so on) has not been shown for *X. ampelinus* under natural conditions (Grall *et al.* 2005).

The bacterium can cause cracks and cankers on fruit stalks (Panagopoulos 1988; Bradbury 1991; EPPO 2009c). However, in international trade, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material, which can be symptomless (CABI-EPPO 1997b; Szegedi and Civerolo 2011).

The risk scenario of concern for *Xylophilus ampelinus* is the presence of the bacterium in imported grape bunches.

4.13.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Xylophilus ampelinus* will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- Bacterial blight has recently been reported on grapevine in Hokkaido, Japan (NIAS 2012; Hokkaido Plant Protection Office 2013). Disease symptoms were observed from 2009–2011 and the causal agent was identified as *X. ampelinus* (Hokkaido Plant Protection Office 2013). No reports were found of *X. ampelinus* in other Japanese prefectures.
- *Xylophilus ampelinus* affects commercially important grapevine cultivars (Panagopoulos 1988). Very susceptible cultivars include 'Thompson Seedless', 'Alicante Bouschet', 'Ugni blanc', 'Granache' and 'Maccabeu' (Panagopoulos 1988). In Hokkaido, the disease affects European varieties/cultivars of *Vitis vinifera* and its hybrids (Hokkaido Plant Protection Office 2013).
- As *X. ampelinus* infects the vascular tissues of infected plants (EPPO 2009c), and is known to spread to grape clusters (Panagopoulos 1988), it is likely to be present in grape bunches from infected plants.
- Distribution of the bacterium within the plant is irregular, varying during the year and between years (Grall *et al.* 2005; EPPO 2009c). An epiphytic lifestyle has not been shown for *X. ampelinus* under natural conditions (Grall *et al.* 2005).
- Infected flowers that have not reached maturity turn black and die, and do not bear fruit (CABI-EPPO 1997b; MAFF 2013d).
- The bacterium can cause cracks and cankers on peduncles and rachises of grape clusters (Panagopoulos 1988; EPPO 2009c). Grape bunches that show symptoms are likely to be removed during harvesting or packing processes.
- Symptoms of the disease may vary significantly depending on the cultivar and possibly environmental conditions (Panagopoulos 1988). Symptoms are most obvious from early spring to midsummer (Panagopoulos 1988).
- Grapevine plants can be contaminated with *X. ampelinus* without showing symptoms (Panagopoulos 1988; Grall *et al.* 2005). The bacterium has been reported to survive in grapevine plants even after removal of visibly infected parts (Bradbury 1991). In Greece, up to 50 per cent of apparently healthy canes from diseased vineyards were latently infected (Panagopoulos 1987). In France, only a few plants showed typical canker symptoms each year in contaminated vineyards studied (Grall *et al.* 2005).

- Cooling of grape bunches during transport and storage is unlikely to affect the viability of the bacterium.
- In international trade, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material (CABI-EPPO 1997b; Szegedi and Civerolo 2011).

The presence of *Xylophilus ampelinus* in the vascular tissue and possibly in grape bunches, combined with the bacterium's potential to remain symptomless in infected plants, moderated by the limited distribution of the disease in Japan and its irregular distribution within the plant, support a likelihood estimate for importation of 'low'.

Probability of distribution

The likelihood that *Xylophilus ampelinus* will be distributed within Australia in a viable state as a result of the processing, sale or disposal of table grapes from Japan and subsequently transfer to a susceptible part of a host is: **Very low**.

Supporting information for this assessment is provided below:

- Imported grapes are intended for human consumption. Based on Japan's limited export capability, it is expected that volumes of table grapes from Japan to Australia per year will be very low. As a result, the majority of grape bunches is likely to be distributed by wholesale trade to the major cities. However, there is a possibility that a proportion of imported grape bunches is distributed by retail trade to areas outside the major cities. Also, there is potential for individual consumers to distribute a small proportion of imported grape bunches to many localities.
- As grapes are easily damaged during handling (Mencarelli *et al.* 2005), packed grapes may not be processed or handled again until they arrive at the retailers. Therefore, pathogens in packed grapes are unlikely to be detected during transportation and distribution to retailers.
- Most fruit waste will be discarded into managed waste systems and will be disposed of in municipal tips and would therefore pose a very low risk for transmission of the bacterium to a susceptible host.
- Grapevine (*Vitis vinifera* and *Vitis* spp. used as rootstock) is the only known host of *Xylophilus ampelinus* (Panagopoulos 1988; Bradbury 1991; Szegedi and Civerolo 2011) and there are no known vectors of the bacterium (Szegedi and Civerolo 2011).
- Consumers will discard small quantities of fruit waste in urban, rural and natural localities. Small amounts of fruit waste will be discarded in domestic compost. There is some potential for consumer waste being discarded near grapevines, including commercially grown, household or feral plants.
- If present in fruit waste, the bacterium would then need to be transferred from the fruit waste in water droplets to susceptible grape tissue where infection could occur, that is wounds or natural openings (Panagopoulos 1987; Bradbury 1991; CABI-EPPO 1997b). This transmission is limited to a short distance for fruit waste on the soil surface.
- A certain concentration of inoculum is likely to be required for successful infection. Information on the concentration of inoculum required for *X. ampelinus* to cause successful infection could not be found.
- Primary infections occur mainly on one to two-year old shoots through leaves, blossoms and grape berries (CABI-EPPO 1997b).

- In Greece, grapevine shoots are highly susceptible from October to late January, less susceptible in February and March, and not susceptible during summer (from June to August) (Panagopoulos 1987). In France, grapevines are highly susceptible to the disease in November and December and in February and March (Grall *et al.* 2005). This information indicates that grapevines are susceptible from autumn to spring and less or not susceptible in summer.
- Generally, Japanese fresh grapes are exported from June to December, with the peak volumes occurring in August–October (ITC Comtrade 2012) (late winter to mid spring in Australia). The Australian spring could present an opportunity for infection as emerging leaves are highly susceptible to infection by *X. ampelinus* (Grall *et al.* 2005). However, a certain dose of inoculum is likely to be required for successful infection.
- In international trade, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material (CABI-EPPO 1997b; Szegedi and Civerolo 2011).
- Cooling of grape bunches during transport and storage is unlikely to affect the viability of the bacterium.

The restricted host range, lack of vectors and the limited potential for the transmission of the assessed pathogen in water droplets from fruit waste to a susceptible part of a host support a likelihood estimate for distribution of ‘very low’.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation with the probability of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Xylophilus ampelinus* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.13.2 Probability of establishment

The likelihood that *Xylophilus ampelinus* will establish within Australia, based on a comparison of factors in the source and destination areas that affect pest survival and reproduction, is: **High**.

Supporting information for this assessment is provided below:

- A range of wine and table grapes (*Vitis* spp.), the only known hosts of *X. ampelinus* (Panagopoulos 1988), are widely grown commercially and domestically in Australia.
- Susceptibility of cultivars varies. Very susceptible cultivars include ‘Thompson Seedless’, ‘Alicante Bouschet’, ‘Ugni blanc’, ‘Granache’ and ‘Maccabeu’ (Panagopoulos 1988). The cultivar ‘Thompson Seedless’ is grown widely in Australia (ATGA 2013).
- There are no known vectors of the bacterium (Szegedi and Civerolo 2011).
- *Xylophilus ampelinus* has been reported present in France, Greece, Italy, Moldova, Portugal, Slovenia, South Africa, Turkey and Spain (Panagopoulos 1988; CABI-EPPO 1997b). The disease probably also occurs in Argentina, Austria, Bulgaria, the Canary Islands, Switzerland and Tunisia (Panagopoulos 1988). Environments with climates similar to these regions exist in various parts of Australia suggesting that *X. ampelinus* has the potential to establish in Australia.

- On artificial media, *X. ampelinus* grows very slowly (Panagopoulos 1988; EPPO 2009c). Minimal and maximal growth temperatures for the bacterium are 6 and 30 °C, respectively (Willems *et al.* 1987). The bacterium does not grow at 33 °C (Panagopoulos 1988).
- The bacterium survives in the vascular tissues of infected plants and cuttings (Panagopoulos 1987; Panagopoulos 1988). Throughout the seasons, the bacterium survives and multiplies in old wood (Grall *et al.* 2005).
- The disease is associated with warm, moist conditions (CABI-EPPO 1997b).
- Prolonged wet periods, overhead irrigation and flooding can all contribute to disease outbreaks (Panagopoulos 1988).
- No efficient control measures are known for controlling the disease (CABI-EPPO 1997b). Viticultural practices to minimise the impact of bacterial blight include: destroying infected shoots and severely infected plants, pruning in dry weather and as late as possible, disinfecting pruning tools between vines, and not using overhead sprinklers (Panagopoulos 1988; CABI-EPPO 1997b).

The suitable climatic conditions in various parts of Australia and the limited control measures available support a likelihood estimate for establishment of 'high'.

4.13.3 Probability of spread

The likelihood that *Xylophilus ampelinus* will spread within Australia, based on a comparison of factors in source and destination areas that affect the expansion of the geographic distribution of the pest, is: **Moderate**.

Supporting information for this assessment is provided below:

- A range of grape varieties (*Vitis* spp.), the only known host of *X. ampelinus* (Panagopoulos 1988), are widely grown commercially and domestically in Australia.
- There are no known vectors of the bacterium (Szegedi and Civerolo 2011).
- *Xylophilus ampelinus* has been reported present in France, Greece, Italy, Moldova, Portugal, Slovenia, South Africa, Turkey and Spain (Panagopoulos 1988; CABI-EPPO 1997b). The disease probably also occurs in Argentina, Austria, Bulgaria, the Canary Islands, Switzerland and Tunisia (Panagopoulos 1988). Environments with climates similar to these regions exist in various parts of Australia suggesting that *X. ampelinus* has the potential to spread in Australia.
- The disease is associated with warm, moist conditions. Prolonged wet periods, overhead irrigation and flooding can all contribute to disease outbreaks (Panagopoulos 1988; CABI-EPPO 1997b).
- Over short distances, the bacterium is transmitted through pruning tools and machinery, and by direct contamination from plant to plant (EPPO 2009c). It spreads locally with moisture (rain or irrigation) to sites where infection can take place such as wounds or leaf scars (Panagopoulos 1987; Bradbury 1991; CABI-EPPO 1997b). Natural dispersal of *X. ampelinus* is limited to the vineyard and the immediately surrounding area (CABI-EPPO 1997b).
- Over long distances, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material (CABI-EPPO 1997b; Szegedi and Civerolo 2011).

However, the interstate movement of grapevine planting material is regulated in Australia (Plant Health Australia 2009). Grapevine planting material certified as being free of pests and pathogens is available from accredited nurseries in Australia, as per the Vine Industry Nursery Accreditation Scheme (VINA 2008).

- Grapevine plants can be contaminated with *X. ampelinus* without showing symptoms (Panagopoulos 1988; Grall *et al.* 2005), which increases the potential for unintended spread of the bacterium. The bacterium has been reported to survive in grapevine plants even after removal of visibly infected parts (Bradbury 1991). In Greece, up to 50 per cent of apparently healthy canes from diseased vineyards were latently infected (Panagopoulos 1987). In France, only a few plants showed typical canker symptoms each year in contaminated vineyards studied (Grall *et al.* 2005).

The suitable climatic conditions in various parts of Australia and the possibility for infected plants not showing symptoms and therefore not being detected early, moderated by the limited natural dispersal of the bacterium and the systems in place for the movement and certification of grapevine planting material in Australia, support a likelihood estimate for spread of 'moderate'.

4.13.4 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Xylophilus ampelinus* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Very low**.

4.13.5 Consequences

The consequences of the establishment of *Xylophilus ampelinus* in Australia have been estimated according to the methods described in Table 2.3.

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for *Xylophilus ampelinus* are estimated to be: **Moderate.**

Reasoning for these ratings is provided below:

Criterion	Estimate and rationale
Direct	
Plant life or health	**Impact score**: E—Significant at the regional level. This bacterium causes a chronic, systemic disease of grapevine which is of significant economic importance (Panagopoulos 1988). It affects commercially important grapevine cultivars (Panagopoulos 1988). Very susceptible cultivars include 'Thompson Seedless' (Panagopoulos 1988), which is grown widely in Australia (ATGA 2013). The disease causes losses through reduced productivity and shortened longevity of infected vineyards (Panagopoulos 1988). Serious harvest losses can occur when susceptible cultivars are severely infected (CABI-EPPO 1997b). For example, 70 per cent losses and more occurred in South Africa in 1940 (CABI-EPPO 1997b). But since 1956 bacterial blight has only occurred sporadically in South Africa and is of no economic importance where copper sprays are used (CABI-EPPO 1997b). In France, serious damage has been reported on a number of susceptible cultivars since 1968 (CABI-EPPO 1997b). In Spain, losses resulting from the disease are considered closely linked to climatic conditions, that is severe symptoms were observed in years with relatively heavy rainfall (López *et al.* 1987). The disease is associated with warm, moist conditions (CABI-EPPO 1997b). Prolonged wet periods, overhead irrigation and flooding can all contribute to disease outbreaks (Panagopoulos 1988).
Other aspects of the environment	**Impact score**: A—Indiscernible at the local level. There are no known direct consequences of this bacterium on other aspects of the natural environment.
Indirect	
Eradication, control etc.	**Impact score**: D—Significant at the district level. No efficient control measures are known for controlling the disease (CABI-EPPO 1997b). Viticultural practices to minimise the impact of bacterial blight include: destroying infected shoots and severely infected plants, pruning in dry weather and as late as possible, disinfecting pruning tools between vines and not using overhead sprinklers (Panagopoulos 1987; Panagopoulos 1988; CABI-EPPO 1997b). Copper sprays can be used to reduce spread of bacteria (Panagopoulos 1987; Bradbury 1991). All planting and grafting material should be sourced from pest-free areas and nursery stock should be inspected and handled appropriately (Panagopoulos 1987; Panagopoulos 1988).
Domestic trade	**Impact score**: D—Significant at the district level. The presence of *X. ampelinus* in commercial production areas could result in interstate trade restrictions on table grapes, potential loss of markets, and significant industry adjustment at the district level. The National Viticulture Industry Biosecurity Plan identifies *X. ampelinus* as a high priority plant pest with a medium risk to the Australian viticulture industry (Plant Health Australia 2009).
International trade	**Impact score**: D—Significant at the district level. *Xylophilus ampelinus* has been reported present in France, Greece, Italy, Moldova, Portugal, Slovenia, South Africa, Turkey, Spain (Panagopoulos 1988; CABI-EPPO 1997b) and Japan (NIAS 2012; Hokkaido Plant Protection Office 2013). It probably also occurs in Argentina, Austria, Bulgaria, the Canary Islands, Switzerland and Tunisia (Panagopoulos 1988). *Xylophilus ampelinus* is an European and Mediterranean Plant Protection Organization (EPPO) A2 quarantine organism, that is the pest is locally present in the EPPO region and the EPPO recommends its members to regulate *X. ampelinus* as a quarantine pest (CABI-EPPO 1997b). *Xylophilus ampelinus* is also of quarantine significance for the North American Plant Protection Organization and the Inter-African Phytosanitary Council (CABI-EPPO 1997b). The presence of this pathogen in commercial production areas of table grapes in Australia could limit access to overseas markets that are free of this pathogen. However, in international trade, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material (CABI-EPPO 1997b; Szegedi and Civerolo 2011).
Environmental and non-commercial	**Impact score**: B—Minor significance at the local level. Control measures for bacterial blight based on cultural practices would have no significant effect. Any additional usage of pesticide sprays may affect the environment.

4.13.6 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Xylophilus ampelinus*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Moderate**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for *Xylophilus ampelinus* has been assessed as 'very low', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.14 Berry drop

Diaporthe melonis var. brevistylospora and *Phomopsis sp.*

Diaporthe melonis var. *brevistylospora* and *Phomopsis* sp. are plant pathogenic fungi which cause the disease berry drop (Datsuryu-byou) in grapevine in Japan (Kinugawa *et al.* 2008). Both fungi cause dieback of pedicels which leads to berry drop in the middle of grape clusters (Kinugawa *et al.* 2008). Berry drop has been observed frequently at harvest time in Kagawa Prefecture since 1999 (Kinugawa *et al.* 2008).

The two fungi assessed here only seem to infect pedicels and rachises which result in berry drop (Kinugawa *et al.* 2008). The related fungus, *Phomopsis viticola*, infects leaves, petioles, young shoots, rachises and fruit (Hewitt and Pearson 1988). Although *Phomopsis viticola* can also cause berry drop when rachises are infected, the major disease caused by *Phomopsis viticola* is cane and leaf spot. Due to the differences in plant parts infected and diseases caused, the risk of *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. is being considered in a separate pest risk assessment from that for *Phomopsis viticola* (assessed in section 4.20).

There is limited information available for *Phomopsis* sp. and thus it is assessed here together with the co-generic species *Diaporthe melonis* var. *brevistylospora* (anamorph: *Phomopsis brevistylospora* Ts. Kobay & Tak. Ohsawa), as the two species cause the same disease and their biology is likely to be the same or very similar, and they are predicted to pose a similar risk and to require similar mitigation measures. Unless explicitly stated, the information presented is considered as applicable to both species. In this section, the common name berry drop is used to refer to both species. The scientific name is used when the information is about a specific species.

The risk scenario of concern for *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. is that these fungi may be present on imported grape bunches.

4.14.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that the assessed species will arrive in Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- Berry drop of grapes caused by *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. occurs in Kagawa Prefecture, Japan (Kinugawa *et al.* 2008). There is no report on the prevalence of the disease (MAFF 2013d), but it has been observed frequently at harvest time in Kagawa Prefecture since 1999 (Kinugawa *et al.* 2008). Grape production in Kagawa Prefecture is small, with 213 hectares plantings and 1520 tonnes of grapes produced in 2012 (MAFF 2013a).

- *Diaporthe melonis* var. *brevistylospora* has also been isolated from diseased melon fruit (*Cucumis melo* L.) in Shizuoka Prefecture (Ohsawa and Kobayashi 1989). Shizuoka is not listed among the prefectures where table grapes are commercially grown in Japan (MAFF 2010a).
- Berry drop in Japan has been primarily observed on the cultivars 'Muscat Bailey A', 'Muscat of Alexandria' and especially on 'Pione' (Kinugawa *et al.* 2008). 'Muscat Bailey A' and 'Muscat of Alexandria' are wine grapes. 'Pione' is one of the table grape cultivars Japan intends to export to Australia.
- *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. cause dieback of pedicels followed by berry drop in the middle of grape clusters at harvest time (Kinugawa *et al.* 2008). Both fungi were isolated from pedicels (Kinugawa 2004; Kinugawa *et al.* 2008) and therefore could be present in grape bunches harvested from infested plants.
- Drop of grape berries starts when the acidity of the berries decreases, and sugar content increases from the beginning of harvest, and continues until the end of harvest (Kinugawa *et al.* 2008).
- Initially, small blackish brown spots occur on pedicels. These spots enlarge, and surround the whole pedicel, and the berries eventually drop off. When the damage is prominent, dieback is also found in parts of the rachis. Berries drop primarily from the centre of the bunch and show no clear wilting or fading (Kinugawa *et al.* 2008). Inoculation studies did not show any spots on grape berries (Kinugawa *et al.* 2008).
- Diseased grape clusters with several berries missing or obvious dieback of pedicels and/or rachises are likely to be removed from the export pathway during harvesting or packing processes, although loss of berries from the centre of the bunch may not be detected.
- Inoculation studies on the pathogenicity of *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. on grape pedicels and berries show that inoculation of non-damaged pedicels or berries, close to harvest, does not lead to berry drop after five days of inoculation (Kinugawa *et al.* 2008). Inoculation of damaged pedicels and berries however leads to up to 73 per cent berry drop for *Phomopsis* sp. and up to 84 per cent for *Diaporthe melonis* var. *brevistylospora*, depending on grape variety and inoculation medium. In these inoculation studies the strain representative of *Diaporthe melonis* var. *brevistylospora* was more pathogenic than the strain representative of *Phomopsis* sp. (Kinugawa *et al.* 2008).
- *Phomopsis* spp. overwinter as mycelium and/or conidia-containing pycnidia (Agrios 2005). Cooling of grape bunches during transport and storage is unlikely to affect the viability of the fungi.

The association of the assessed fungi with grape bunches, the potential for the fungi to remain viable after cold storage and transport, moderated by the limited distribution of the disease in Japan and the fact that affected bunches with berry drop or obvious dieback of pedicels and/or rachises are likely removed from the export pathway, support a likelihood estimate for importation of 'moderate'.

Probability of distribution

The likelihood that the assessed species will be distributed within Australia in a viable state as a result of the processing, sale or disposal of table grapes from Japan and subsequently transfer to a susceptible part of a host is: **Very low**.

Supporting information for this assessment is provided below:

- Imported grapes are intended for human consumption. Based on Japan's limited export capability, it is expected that volumes of table grapes from Japan to Australia per year will be very low. As a result, the majority of grape bunches is likely to be distributed by wholesale trade to the major cities. However, there is a possibility that a proportion of imported grae bunches is distributed by retail trade to areas outside the major cities. Also, there is potential for individual consumers to distribute a small proportion of imported grape bunches to many localities.
- As grapes are easily damaged during handling (Mencarelli *et al.* 2005), packed grapes may not be processed or handled again until they arrive at the retailers. Therefore, pathogens in packed grapes are unlikely to be detected during transportation and distribution to retailers.
- Grape bunches with obvious symptoms of infection would not be marketable and would not be sold. Grape bunches without symptoms, or with only minor symptoms, could be marketable and could be sold.
- Most fruit waste will be discarded into managed waste systems and will be disposed of in municipal tips and would therefore pose little risk of exposure to a suitable host.
- Consumers will discard small quantities of fruit waste in urban, rural and natural localities. Small amounts of fruit waste will be discarded in domestic compost. There is some potential for consumer waste being discarded near host plants, including commercially grown, household or wild host plants. If present in fruit waste, the assessed fungi would then need to be transferred to a susceptible host.
- Conidia of plant pathogens belonging to *Diaporthe*/*Phomopsis* are mainly spread by rain splash (Agrios 2005). If present in fruit waste, the conidia would then need to be transferred from the fruit waste in water droplets to susceptible host tissue where infection could occur, that is rachis and pedicel. This transmission is limited to a short distance for fruit waste on the soil surface.
- The assessed fungi are likely to require suitable periods of moisture and temperature to produce pycnidia and then conidia. After conidia have been successfully produced and transferred to a new host, suitable infection sites need to be available.
- No information was found on the conditions required for infection of hosts, but observations with concave rot of melon fruit, caused by *Diaporthe melonis* var. *brevistylospora*, indicate that rain during a certain stage of fruit development seems to be associated with disease outbreaks.
- *Diaporthe melonis* var. *brevistylospora* was identified as one of the agents causing concave rot of melon fruit in Japan (Ohsawa and Kobayashi 1989). Concave rot of melon fruit was frequently observed on fruits brought to the markets in Tokyo and Osaka from June to October (Ohsawa and Kobayashi 1989). A close relationship between cloudy and rainy weather during net formation of melon fruit and high frequency of disease occurrence was also observed (Ohsawa and Kobayashi 1989).
- Studies of a pathogen identified as *Phomopsis brevistylospora* (the anamorph of *Diaporthe melonis* var. *brevistylospora*), which causes postharvest disease on rockmelon in China, show that optimal temperature for mycelium development is between 22.5 °C to 30 °C and optimal temperature for symptom development is 25 °C (Jiang *et al.* 2007).

- Most species of *Phomopsis* are considered to be hemibiotrophic, subsisting on living tissues for parts of its life cycle and becoming nectrotrophic at least for the latent phase of infection (Udayanga *et al.* 2011). *Phomopsis* species can also grow saprophytically on synthetic media (Punithalingam 1964) although this is not representative of field conditions. The ability to grow nectrotrophically, and potentially saprophytically, would allow the assessed fungi to remain in a viable state on discarded table grape bunches.
- Once a bunch is detached from the plant it starts to lose moisture. Table grapes are well known to be subject to serious water loss following harvest (Crisosto and Smilanick 2004). Waste material discarded into the environment would continue to desiccate and additional external moisture may be required for the assessed fungi to produce pycnidia and then sporulate.
- Discarded bunches are likely to be colonised by specialist saprophytic fungi and bacteria that would compete with the assessed fungi for the substrate.
- The known natural hosts of *Diaporthe melonis* var. *brevistylospora* are grapevine and melon (Ohsawa and Kobayashi 1989; Kinugawa *et al.* 2008). The only described natural host of *Phomopsis* sp. is grapevine (Kinugawa *et al.* 2008). These hosts are grown commercially as well as in home gardens in many parts of Australia.
- Other potential hosts of the assessed fungi include kiwifruit, mandarin and apple, as damaged fruit of these plants were infected by *Diaporthe melonis* var. *brevistylospora* in inoculation studies (Kinugawa *et al.* 2008). To date, there have been no reports of these plants being infected by this pathogen in natural conditions. These plants are widely grown in Australia.
- On grapes, inoculation studies show that damaged pedicels and berries of grape are susceptible to infection by the assessed fungi close to harvest (Kinugawa *et al.* 2008). Inoculation of non-damaged pedicels or berries, close to harvest, does not lead to berry drop five days after inoculation (Kinugawa *et al.* 2008).
- Generally, Japanese fresh grapes are exported from June to December, with the peak volumes occurring in August–October (ITC Comtrade 2012) (late winter to mid spring in Australia). No detailed information was found on the time/growth stage when hosts of the assessed fungi are susceptible to infection. However, as the assessed fungi only seem to infect pedicels and rachises of grapevine, susceptibility for infection is unlikely to start prior to the development of individual flower parts.
- Development of individual flower parts of grapevine extends from just before bud break to flowering (AWRI 2010). In Australia, flowering of wine grapes typically starts in November (AWRI 2010). Flowering of table grapes can start as early as September (Nesbitt *et al.* 2004). Melons are produced all year round in Australia (Australian Melon Association Inc. 2013) and susceptible plants are expected to be available throughout the year.
- *Phomopsis* spp. overwinter as mycelium and/or conidia-containing pycnidia (Agrios 2005). Cooling of grape bunches during transport and storage is unlikely to affect the viability of the fungi.

The limited host range, limited susceptible tissues (rachis and pedicel) for infection and the limited potential for unassisted transmission of the assessed fungi from fruit waste to a susceptible part of a host, support a likelihood estimate for distribution of ‘very low’.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that the assessed species will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.14.2 Probability of establishment

The likelihood that the assessed species will establish within Australia, based on a comparison of factors in the source and destination areas that affect pest survival and reproduction, is: **High**.

Supporting information for this assessment is provided below:

- The known natural hosts of *Diaporthe melonis* var. *brevistylospora* are grapevine and melon (Ohsawa and Kobayashi 1989; Kinugawa *et al.* 2008). The only described natural host of *Phomopsis* sp. is grapevine (Kinugawa *et al.* 2008). These hosts are grown commercially as well as in home gardens in many parts of Australia.
- Other potential hosts of the assessed fungi include kiwifruit, mandarin and apple, as damaged fruit of these plants were infected by *Diaporthe melonis* var. *brevistylospora* in inoculation studies (Kinugawa *et al.* 2008). To date, there have been no reports of these plants being infected by this pathogen in natural conditions. These plants are widely grown in Australia.
- To date, berry drop (Datsuryu-byou) of grapevine has only been reported present in Kagawa Prefecture, Japan. On melon, concave rot caused by *Diaporthe melonis* var. *brevistylospora* has been reported from Shizuoka Prefecture, Japan (Ohsawa and Kobayashi 1989) and postharvest disease caused by *Phomopsis brevistylospora* (the anamorph of *Diaporthe melonis* var. *brevistylospora*) has been reported from China (Jiang *et al.* 2007). Environments with climates similar to those in Japan and China exist in various parts of Australia suggesting that the assessed fungi have the potential to establish in Australia.
- Other species of *Phomopsis* are established in Australia (Plant Health Australia 2001a) indicating the suitability of the Australian environment.
- Under experimental conditions, the two assessed fungi grow best at 27 °C, with *Phomopsis* sp. slower growing than *Diaporthe melonis* var. *brevistylospora* (Kinugawa *et al.* 2008).
- Laboratory studies show that *Phomopsis brevistylospora* has an optimum temperature for mycelium development between 22.5 and 30 °C (Jiang *et al.* 2007). Its optimum temperature for symptom development is 25 °C (Jiang *et al.* 2007).
- *Phomopsis* spp. overwinter as mycelium and/or conidia-containing pycnidia (Agrios 2005).
- No information was found on the environmental conditions required for infection and disease outbreak in grapevine.
- Observations on concave rot of melon, caused by *Diaporthe melonis* var. *brevistylospora*, indicate that occurrence of the disease seems to be favoured by cloudy and rainy weather during net formation of melon fruit (Ohsawa and Kobayashi 1989).

- No reports on control measures for berry drop were found. Plant diseases caused by pathogens belonging to the genus *Diaporthe*/*Phomopsis* are generally managed by sanitation and application of appropriate fungicides (Agrios 2005).

The suitable climatic conditions in various parts of Australia and the fact that other *Phomopsis* species have established in Australia support a likelihood estimate for establishment of ‘high’.

4.14.3 Probability of spread

The likelihood that the assessed species will spread within Australia, based on a comparison of factors in source and destination areas that affect the expansion of the geographic distribution of the pest, is: **Moderate**.

Supporting information for this assessment is provided below:

- Infected host fruit may be distributed throughout Australia for human consumption. The movement of infected propagation material or nursery stock may also contribute to spreading the assessed fungi to new areas.
- The known natural hosts of *Diaporthe melonis* var. *brevistylospora* are grapevine and melon (Ohsawa and Kobayashi 1989; Kinugawa *et al.* 2008). The only described natural host of *Phomopsis* sp. is grapevine (Kinugawa *et al.* 2008). These hosts are grown commercially as well as in home gardens in many parts of Australia.
- Other potential hosts of the assessed fungi include kiwifruit, mandarin and apple, as damaged fruit of these plants were infected by *Diaporthe melonis* var. *brevistylospora* in inoculation studies (Kinugawa *et al.* 2008). To date, there have been no reports of these plants being infected by this pathogen in natural conditions. These plants are widely grown in Australia.
- To date, berry drop (Datsuryu-byou) of grapevine has only been reported present in Japan (Kagawa Prefecture) (Kinugawa *et al.* 2008). On melon, *Diaporthe melonis* var. *brevistylospora* has been reported both from Shizuoka Prefecture, Japan and its anamorph, *Phomopsis brevistylospora* has been reported from China (Ohsawa and Kobayashi 1989; Jiang *et al.* 2007). Environments with climates similar to those in Japan and China exist in various parts of Australia suggesting that the assessed fungi have the potential to spread in Australia.
- Berry drop of grapevine has been observed in Kagawa Prefecture since 1999 (Kinugawa *et al.* 2008) but there has been no record of this disease having spread to other regions in Japan.
- Observations on concave rot of melon, caused by *Diaporthe melonis* var. *brevistylospora*, indicate that occurrence of the disease seems to be favoured by cloudy and rainy weather during net formation of melon fruit (Ohsawa and Kobayashi 1989).
- Conidia of plant pathogens belonging to *Diaporthe*/*Phomopsis* are mainly spread by rain splash (Agrios 2005).
- *Phomopsis* spp. overwinter as mycelium and/or conidia-containing pycnidia (Agrios 2005).

The suitable climatic conditions in various parts of Australia, moderated by the limited ability of the fungal spores to spread unassisted, support a likelihood estimate for spread of 'moderate'.

4.14.4 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that the assessed species will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Very low**.

4.14.5 Consequences

The consequences of the establishment of the assessed species in Australia have been estimated according to the methods described in Table 2.3.

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for the assessed species are estimated to be: **Low**.

Reasoning for these ratings is provided below:

Criterion	Estimate and rationale
Direct	
Plant life or health	**Impact score**: C—Minor significance at the district level. In grapevine, *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. cause dieback of pedicels which leads to berry drop in the middle of grape clusters (Kinugawa *et al.* 2008). Berry drop has been observed frequently at harvest time in Kagawa Prefecture since 1999 (Kinugawa *et al.* 2008). No other reports of economic losses on grapevine were found. Inoculation studies showed no pathogenicity of the assessed fungi for new leaves of grapevine (Kinugawa *et al.* 2008). This study also observed no abnormalities of leaves or branches and no spots on the fruit (Kinugawa *et al.* 2008). *Diaporthe melonis* var. *brevistylospora* and its anamorph, *Phomopsis brevistylospora*, also causes postharvest rot of melon fruit in Japan and China, respectively (Ohsawa and Kobayashi 1989; Jiang *et al.* 2007). *Diaporthe melonis* var. *brevistylospora* has also been shown to be pathogenic to fruit of kiwifruit, mandarin and apple when inoculated on damaged fruit surfaces (Kinugawa *et al.* 2008). To date, however, there have been no reports of these plants being infected by this pathogen in natural conditions. No other reports of economic losses on these artificial hosts or any other hosts were found. Observations on concave rot of melon, caused by *Diaporthe melonis* var. *brevistylospora*, indicate that occurrence of the disease seems to be favoured by cloudy and rainy weather (Ohsawa and Kobayashi 1989). Thus, potential disease outbreaks in parts of Australia where rainfall is low might be limited due to unfavourable environmental conditions.
Other aspects of the environment	**Impact score**: A—Indiscernible at the local level. There are no known direct consequences of these fungi on other aspects of the natural environment.
Indirect	
Eradication, control etc.	**Impact score**: C—Minor significance at the district level. No reports on control measures were found. Measures used to control other pathogens of the genus *Phomopsis* may be effective in controlling the assessed fungi. Plant diseases caused by pathogens belonging to the genus *Diaporthe*/*Phomopsis* are generally managed by sanitation and application of appropriate fungicides (Agrios 2005).

Criterion	Estimate and rationale
Domestic trade	**Impact score**: D—Significant at the district level. The presence of *D. melonis* var. *brevistylospora* and/or *Phomopsis* sp. in commercial production areas could result in interstate trade restrictions on table grapes and melon, potential loss of markets, and significant industry adjustment at the district level.
International trade	**Impact score**: D—Significant at the district level. To date, berry drop of grapevine has only been reported present in Japan. Postharvest disease of melon, caused by *Diaporthe melonis* var. *brevistylospora* or its anamorph *Phomopsis brevistylospora* has been reported both from Japan and China (Ohsawa and Kobayashi 1989; Jiang *et al.* 2007). The presence of the assessed pathogens in commercial production areas of table grapes and melons in Australia could limit access to overseas markets that are free of these pathogens.
Environmental and non-commercial	**Impact score**: B—Minor significance at the local level. Any additional usage of pesticide sprays may affect the environment.

4.14.6 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp.	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Diaporthe melonis* var. *brevistylospora* and *Phomopsis* sp. has been assessed as ‘negligible’, which achieves Australia’s ALOP. Therefore, no specific risk management measures are required for these pests.

4.15 Bitter rot

Greeneria uvicola[WA]

Bitter rot of grapevine is caused by the fungus *Greeneria uvicola.* The disease occurs on many *Vitis* spp. including *Vitis vinifera, V. labrusca*, *V. aestivalis, V. bourquina, V. rotundifolia* and *V. munsoniana* (Ridings and Clayton 1970; Farr *et al.* 2001; Longland and Sutton 2008) under warm and humid conditions (McGrew 1988; Farr *et al.* 2001). Bitter rot disease is, however, more severe on muscadine grapes (*V. rotundifolia)* (McGrew 1988). Under experimental conditions, the fungus has also been shown to infect wounded fruit of apple, cherry, strawberry, peach, blueberry and banana causing fruit rot (Ridings and Clayton 1970). However, *G. uvicola* is not known to cause problems on horticultural crops other than grapes.

In Australia, *G. uvicola* is known to be present in New South Wales (NSW) and Queensland (Qld) (Castillo-Pando *et al.* 1999; Castillo-Pando *et al.* 2001; Sergeeva *et al.* 2001; Plant Health Australia 2001a) but has not been recorded in Western Australia (DAWA 2006a; Taylor 2012) and is a pest of quarantine concern for that state.

Greeneria uvicola has been reported on grapevine in Japan (McGrew 1988; MAFF 1989b; NIAS 2013).

The fungus can infect young shoots, leaves, tendrils, peduncle, rachis, pedicels and fruit of grapevine (Kummuang *et al.* 1996b; Ellis 2008a). It has also been isolated from dormant canes, wood and bark (Castillo-Pando *et al.* 2001; Emmett 2006). *Greeneria uvicola* has been reported to cause girdling of shoots, flecking of young leaves, stems, shoots and individual flower buds (McGrew 1988; Tashiro 1992; Kummuang *et al.* 1996b; Momol *et al.* 2007). The fungus can invade any injured tissue of *Vitis* spp. plants (McGrew 1988).

Although *G. uvicola* can infect many different tissues of grapevine, the disease mainly damages fruit, particularly if rainy weather persists into the harvest season (Farr *et al.* 2001). On young berries, symptoms first develop as brown lesions (Milholland 1991) or flecks (Kummuang *et al.* 1996b). Severe infection can cause blight on young berries and pedicels which causes young berries to shrivel and drop (McGrew 1988; Kummuang *et al.* 1996b; Momol *et al.* 2007). On maturing berries, the fungus has been reported to cause brownish, water-soaked lesions, with concentric rings of spore bodies, which rapidly spread and eventually cover the entire berry (Momol *et al.* 2007; Ellis 2008a). Black, raised spore-bearing structures (acervuli) form on the decaying fruit which can cause the epidermis and cuticle to rupture (McGrew 1988; Momol *et al.* 2007). Some infected berries soften and detach easily from the bunch, particularly in wet weather, whilst others continue to dry and shrivel (Ullasa and Rawal 1986; McGrew 1988; Momol *et al.* 2007; Taylor 2012).

There are mixed reports on at what developmental stage berries are susceptible to infection. The incidence of bitter rot disease for muscadine grapes (*V. rotundifolia*) on non-sprayed vines was reported to be more severe on young berries and decreased drastically thereafter (1996b). The authors stated that bitter rot symptoms had already been observed on some flower buds. Steel *et al*. (2012) reported on their inoculation study that inflorescences of Chardonnay grapes (*V. vinifera*) were also susceptible to infection by *G. uvicola*, and infection of inflorescences at mid-flowering led to berry rot at veraison. There are also reports to suggest that grapes of several *V. vinifera* cultivars become more susceptible to infection after veraison (Steel 2007; Steel *et al.* 2007). In inoculation studies conducted over two years using three *V. vinifera* cultivars, it was reported that the susceptibility of grapes increased from bloom until veraison in one year, and from bloom until two weeks before veraison in the other year (Longland and Sutton 2008).

Reports on the timing of first symptoms on berries also vary. For muscadine grapes on non-sprayed field-grown vines, the development of symptoms varies between different muscadine cultivars and vineyard locations, but disease symptoms were most prevalent on all cultivars at the young berry stage (Kummuang *et al.* 1996b). The authors also reported that *G. uvicola* was isolated from symptomless berries, especially those late in the growing season (Kummuang *et al.* 1996b). McGrew (1988) and Momol *et al*. (2007) reported that greenish brown lesions can be found on young muscadine berries as well as blight of pedicels, which causes the young berries to shrivel and break off. However, these same authors also stated, but did not mention on what type of grapes, that *G. uvicola* invades corky lenticular warts which form on the pedicel in the spring (shortly after flowering) but remains latent until the berry reaches maturity. The fungus then invades the pedicel and moves into the berry, where conidia are produced within four days (McGrew 1988; Momol *et al.* 2007). It is unknown if these reports (McGrew 1988; Momol *et al.* 2007) were based on field (vineyard) observation or results of inoculation studies. Longland and Sutton (2008) reported on their inoculation studies, where grapes were inoculated from bloom until two weeks before harvest, that symptoms were not observed until close to harvest.

Greeneria uvicola overwinters on mummified berries, damaged shoot tips, infected senescent and fallen leaves, and necrotic bark (Kummuang *et al.* 1996a; Farr *et al.* 2001; Momol *et al.* 2007; Smith 2012). The optimum temperature for infection is around 28–30 °C (Ridings and Clayton 1970; Sutton and Gibson 1977; McGrew 1988; Momol *et al.* 2007; Taylor 2012). Even though one author stated that transmission of the fungus is via air-borne conidia (Sutton and Gibson 1977), most authors agree that conidia of *G. uvicola* are spread by rain splash (Kummuang *et al.* 1996a; MAFF 2008a; Ellis 2008a; Smith 2012).

The risk scenario of concern for *G. uvicola* is that symptomless infected grape bunches may be imported into Western Australia.

4.15.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *G. uvicola* will arrive in Western Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- *Greeneria uvicola* is a recognised pathogen of grapevine in Japan (McGrew 1988; MAFF 1989b; NIAS 2013). In Kobe (Hyogo Prefecture), this pathogen has been present since 1972 (Gohda *et al.* 1976).
- *Greeneria uvicola* infects grape clusters (McGrew 1988). On young berries, symptoms first develop as brown lesions (Milholland 1991) or flecks (Kummuang *et al.* 1996b). Severe infection can cause blight on young berries and pedicels, which causes young berries to shrivel and drop (McGrew 1988; Kummuang *et al.* 1996b; Momol *et al.* 2007).

- On maturing berries, the fungus causes brownish, water-soaked lesions, with concentric rings of spore bodies, which rapidly spread and eventually cover the entire berry (Momol *et al.* 2007; Ellis 2008a; Taylor 2012). Black, raised acervuli form on the decaying fruit, which can cause the epidermis and cuticle to rupture (McGrew 1988; Momol *et al.* 2007). Some infected berries soften and detach easily from the bunch, particularly in wet weather, whilst others continue to dry and shrivel (Ullasa and Rawal 1986; McGrew 1988; Momol *et al.* 2007; Taylor 2012). Grape bunches with berries missing, or with shrivelled berries, are likely to be discarded during harvesting or packing processes.
- Symptoms of infection are easily recognised on the berries and are reported to develop on healthy berries one week after contact with fungal spores and in less time on damaged fruit (Castillo-Pando *et al.* 1999; Ellis 2008a). However, one study that pinned bitter-rotted berries onto healthy bunches did not result in infection of adjacent non-wounded berries (Ridings and Clayton 1970). It has also been reported that grapes inoculated with *G. uvicola* from bloom to two weeks before harvest did not show symptoms until close to harvest (Longland and Sutton 2008). Some authors report that *G. uvicola* invades pedicels of grapes in the spring (shortly after flowering) but remains latent until the berry reaches maturity (McGrew 1988; Momol *et al.* 2007). The fungus then invades the berries, where conidia are produced within four days (McGrew 1988). Kummuang *et al.* (1996b) reported that *G. uvicola* was isolated from symptomless berries, especially those infected late in the growing season. Infected grape bunches without or with only mild symptoms at harvest may escape detection and be picked and packed for export.
- The fungus can invade any injured tissue of *Vitis* spp. plants (McGrew 1988). Injury to mature, healthy berries due to bird and insect damage or cracking of berries due to rain can allow conidial infection and lead to rapid spread of the disease (McGrew 1988; Momol *et al.* 2007). Damaged grape berries/bunches are likely to be removed from the export pathway during harvesting and packing processes.
- Measures used to control *G. uvicola* in Japan include application of fungicide and cleanup of infected vines and fruits in the orchard (MAFF 2008a). In Japan, conidia of *G. uvicola* on diseased vines, infected the previous year, are produced from April to September, and are most abundant from April to June (Kato *et al.* 1978). The best timing for fungicide application in Japan is from April to July (Kato *et al.* 1978).
- Bitter rot symptoms develop quickly on mature berries. It could be expected that any berries with latent infection that were picked and packed for export via sea freight would show symptoms by the time they arrive in Western Australia. Grape bunches showing symptoms would be detected during routine inspection on arrival. However, grapes are usually stored at low temperatures to prolong shelf life. Information on the time required for symptoms to develop under cold storage conditions could not be found, but it is likely that symptoms will develop more slowly under low temperatures. Grapes via air freight may show no or mild symptoms at the time they arrive in Western Australia. Grape bunches without symptoms, or with only minor symptoms, may not be detected at routine inspection on arrival.

The possibility for some late infected berries to show no or mild symptoms and the uncertainty about the development of symptoms at low temperatures, support a likelihood estimate for importation of ‘high’.

Probability of distribution

The likelihood that *G. uvicola* will be distributed within Western Australia in a viable state as a result of the processing, sale or disposal of table grapes from Japan and subsequently transfer to a susceptible part of a host is: **Very low**.

Supporting information for this assessment is provided below:

- Imported grapes are intended for human consumption. Based on Japan's limited export capability, it is expected that volumes of table grapes from Japan to Australia per year will be very low. As a result, the majority of imported grape bunches is likely to be distributed by wholesale trade to the major cities. However, there is a possibility that a proportion of the imported grape bunches is distributed by retail trade to areas outside the major cities. Also, there is potential for individual consumers to distribute a small proportion of imported grape bunches to many localities within the state.
- As grapes are easily damaged during handling (Mencarelli *et al.* 2005), packed grapes may not be processed or handled again until they arrive at the retailers. Therefore, pathogens in packed grapes are unlikely to be detected during transportation and distribution to retailers.
- Bitter rot symptoms develop quickly on mature berries. It could be expected that infected berries would show symptoms by the time they arrive at the retailers. Grape bunches with obvious symptoms of infection would not be marketable and would not be sold. However, if grapes are transported at low temperatures, symptoms may develop more slowly. Grape bunches without symptoms, or with only minor symptoms, could be marketable and could be sold.
- Most fruit waste will be discarded into managed waste systems and will be disposed of in municipal tips and would therefore pose little risk of exposure to a suitable host.
- Consumers will discard small quantities of fruit waste in urban, rural and natural localities. Small amounts of fruit waste will be discarded in domestic compost. There is some potential for consumer waste being discarded near host plants, including commercially grown, household or wild host plants. If present in fruit waste, the pathogen would then need to be transferred to a susceptible host.
- The primary host of *G. uvicola* is *Vitis rotundifolia*, but other *Vitis* spp. are also susceptible including *V. vinifera*, *V. bourquina*, *V. labrusca* and *V. munsoniana* (Ridings and Clayton 1970; Farr *et al.* 2001; Longland and Sutton 2008). No other natural hosts are known. While it was reported more than 40 years ago that, under experimental conditions, *G. uvicola* can infect wounded fruit of apple, cherry, strawberry, peach, blueberry and banana (Ridings and Clayton 1970), there have been no reports found on natural infestation on these plant species.
- In Western Australia, *Vitis* spp. are grown commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013).
- Commercial table grape vineyards in Western Australia are located near the Western Australian coast, extending from the Gascoyne region (including Carnarvon) to the South-West region (including Harvey, Donnybrook, Margaret River and Busselton) (DAWA 2006b). The main wine grape production spans from Gingin just north of Perth, extending through the south-west and across to the Porongurup Range near Mount Baker (DAFWA 2006).

- Even though one author reports that transmission of the fungus is via air-borne conidia (Sutton and Gibson 1977), most authors agree that conidia of *G. uvicola* are spread by rain splash (Kummuang *et al.* 1996a; MAFF 2008a; Ellis 2008a; Smith 2012). The transmission of conidia via rain splash is limited to a short distance for fruit waste on the ground.
- The fungus can infect young shoots, leaves, tendrils, peduncle, rachis, pedicels and fruit of grapevine (Kummuang *et al.* 1996b; Ellis 2008a). It has also been isolated from dormant canes, wood and bark (Castillo-Pando *et al.* 2001; Emmett 2006). The fungus can invade any injured tissue of *Vitis* spp. plants (McGrew 1988).
- Generally Japanese fresh grapes are exported from June to December, with the peak volumes occurring in August–October (ITC Comtrade 2012) (late winter to mid spring in Australia). Grapevines in Western Australia would be susceptible to infection during parts of the expected export window.

The host susceptibility during the expected export window, moderated by the limited potential for dispersal of conidia via rain splash from fruit waste to a susceptible part of a host, the limited host range and the fact that very low volumes, if any, of imported grape bunches will be distributed within Western Australia support a likelihood estimate for distribution of 'very low'.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *G. uvicola* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.15.2 Probability of establishment

The likelihood that *G. uvicola* will establish within Western Australia, based on a comparison of factors in the source and destination areas that affect pest survival and reproduction, is: **LOW**.

Supporting information for this assessment is provided below:

- *Greeneria uvicola* in culture has an optimum growth temperature of 28–30 °C with no growth at 40 °C (Ridings and Clayton 1970). Spore germination occurs above 12 °C with an optimum at 28–32 °C (Ridings and Clayton 1970). In general, growth and spore production of *G. uvicola* are favoured by warm, humid and rainy weather (Ellis 2008a).
- Infection is temperature dependant and some reviews summarise that infection occurs from 12 °C to an optimum of 28–30 °C (McGrew 1988; Taylor 2012). When grape berries were inoculated with a *G. uvicola* spore suspension, infection was significantly higher at 27 °C than at 20 °C (after five days) (Steel *et al.* 2011). When detached inflorescences were inoculated, infection was highest at 30 °C (Steel *et al.* 2012). A certain period of wetness may be required for infection to occur. In laboratory studies, optimal conditions for infection of mature fruit of *V. vinifera* were 22.4–24.6 °C and 6 or 12 hours of wetness (Longland and Sutton 2008).
- Steel *et al.* (2011) reported that co-inoculation of *G. uvicola* with *Botrytis cinerea* strongly reduced infection with *G. uvicola* at 20 °C but not at 27 °C. Co-inoculation with

Colletotrichum acutatum significantly reduced infection with *G. uvicola* both at 20 and 27 °C (Steel *et al.* 2011). This indicates that control of these other bunch rot fungi, through methods that do not also control *G. uvicola*, could favour the establishment of *G. uvicola*.

- The primary host of *G. uvicola* is *Vitis rotundifolia*, but other *Vitis* spp. are also susceptible, including *V. vinifera*, *V. bourquina*, *V. labrusca* and *V. munsoniana* (Ridings and Clayton 1970; Farr *et al.* 2001; Longland and Sutton 2008). No other natural hosts are known.
- In Western Australia, *Vitis* spp. are grown commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013).
- While it was reported more than 40 years ago that, under experimental conditions, *G. uvicola* can infect wounded fruit of apple, cherry, strawberry, peach, blueberry and banana (Ridings and Clayton 1970), there have been no reports found on natural infestation on these species. These plants are grown in Western Australia.
- In Australia, *G. uvicola* has been reported in north-eastern NSW in the Hunter Valley, Mudgee wine region and Hastings Valley on wine grapes, and at Mundubbera in Qld on table grapes (Castillo-Pando *et al.* 1999; Castillo-Pando *et al.* 2001; Sergeeva *et al.* 2001; Plant Health Australia 2001a; Emmett 2006; Steel *et al.* 2007; Qiu *et al.* 2011). However, it does not appear to cause damage in other grape growing areas of eastern Australia. In areas of NSW and Qld where *G. uvicola* occurs, there is high predisposition to infection in the eastern vineyards where relative humidity is high and little to no infection in the dryer inland central vineyards where the daytime temperature is significantly higher (Steel and Greer 2008). The distribution of the pathogen is generally limited to warm and humid climatic regions (McGrew 1988) with high summer and autumn rainfall (Ullasa and Rawal 1986; Kummuang *et al.* 1996a; Farr *et al.* 2001).
- Commercial table grape vineyards in Western Australia are located near the Western Australian coast, extending from the Gascoyne region (including Carnarvon) to the South-West region (including Harvey, Donnybrook, Margaret River and Busselton) (DAWA 2006b). The main wine grape production spans from Gingin just north of Perth, extending through the south-west and across to the Porongurup Range near Mount Baker (DAFWA 2006).
- The south-western regions of Western Australia experience a temperate climate with warm dry summers, cooler winters and high rainfall during the winter months. Areas north of Perth into the Gascoyne region and up to Carnarvon experience typically more desert and tropical climates with hot summers, warm winters and lower rainfall. Suitable climate conditions for growth, sporulation and infection of this fungus appear to be limited in Western Australia, although they could exist in some pockets within that state.

The specific environmental requirements for growth, sporulation and infection of the fungus and the limited host range support a risk rating for establishment of 'low'.

4.15.3 Probability of spread

The likelihood that *G. uvicola* will spread within Western Australia, based on a comparison of factors in source and destination areas that affect the expansion of the geographic distribution of the pest, is: **Low**.

Supporting information for this assessment is provided below:

- Infected grape clusters may be distributed throughout Western Australia for human consumption and the movement of infected nursery stocks may contribute to spreading the fungus to new areas.
- The primary host of *G. uvicola* is *Vitis rotundifolia*, but other *Vitis* spp. are also susceptible, including *V. vinifera*, *V. bourquina*, *V. labrusca* and *V. munsoniana* (Ridings and Clayton 1970; Farr *et al.* 2001; Longland and Sutton 2008). No other natural hosts are known. In Western Australia, *Vitis* spp. are grown commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013).
- While it was reported more than 40 years ago that, under experimental conditions, *G. uvicola* can infect wounded fruit of apple, cherry, strawberry, peach, blueberry and banana (Ridings and Clayton 1970), there have been no reports found on natural infestation on these plant species. These artificial hosts are grown in Western Australia.
- Even though one author reports that transmission of the fungus is via air-borne conidia (Sutton and Gibson 1977), no reference was found to support that conidia are spread by wind. Most authors agree that conidia of *G. uvicola* are spread by rain splash (Kummuang *et al.* 1996a; MAFF 2008a; Ellis 2008a; Smith 2012). In wet conditions, conidia present on the surface of infected grapes or vines can be spread via rain splash to other fruit as well as all green portions of the plant (Ellis 2008a; Smith 2012). The fungus can also be transmitted in infected stem internodes (Sutton and Gibson 1977).
- Injury to mature berries due to bird and insect damage or cracking of berries due to rain can allow conidial infection and lead to rapid spread of the disease (McGrew 1988; Momol *et al.* 2007).
- Infection occurs from 12 °C to an optimum of 28–30 °C (McGrew 1988; Taylor 2012). Mycelial growth is inhibited above 36 °C (McGrew 1988). In general, growth and spore production of *G. uvicola* are favoured by warm, humid and rainy weather (Ellis 2008a).
- In laboratory studies, optimal conditions for infection of mature fruit of *V. vinifera* were 22.4–24.6 °C and 6 or 12 hours of wetness (Longland and Sutton 2008).
- The distribution of this pathogen is generally limited to warm and humid climatic regions (McGrew 1988) with high summer and autumn rainfall (Ullasa and Rawal 1986; Kummuang *et al.* 1996a; Farr *et al.* 2001).
- Commercial table grape vineyards in Western Australia are located near the Western Australian coast, extending from the Gascoyne region (including Carnarvon) to the South-West region (including Harvey, Donnybrook, Margaret River and Busselton) (DAWA 2006b). The main wine grape production spans from Gingin just north of Perth, extending through the south-west and across to the Porongurup Range near Mount Baker (DAFWA 2006).
- The south-western regions of Western Australia experience a temperate climate with warm dry summers, cooler winters and high rainfalls during the winter months. Areas north of Perth into the Gascoyne region and up to Carnarvon experience typically more desert and tropical climates with hot summers, warm winters and lower rainfall. Suitable climate conditions for the development and spread of the disease appear to be limited in Western Australia, although they could exist in some pockets within that state.
- In Australia, *G. uvicola* has been reported in north-eastern NSW in the Hunter Valley, Mudgee wine region and Hastings Valley, and at Mundubbera in Qld (Castillo-Pando

et al. 1999; Castillo-Pando *et al.* 2001; Sergeeva *et al.* 2001; Plant Health Australia 2001a; Steel *et al.* 2007; Qiu *et al.* 2011). There has been no report of this disease having spread to other regions in Australia.

The limited range of dispersal of conidia via rain splash, the limited host range, and the lack of reports of the disease having spread outside the four regions where it is found in eastern Australia, support a likelihood estimate for spread of 'low'.

4.15.4 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *G. uvicola* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Very low**.

4.15.5 Consequences

The consequences of the establishment of *G. uvicola* in Western Australia have been estimated according to the methods described in Table 2.3.

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for *G. uvicola* are estimated to be: **Low**.

Reasoning for these ratings is provided below:

Criterion	Estimate and rationale
Direct	
Plant life or health	**Impact score**: D—Significant at the district level. *Greeneria uvicola* infects many species of grape, including *Vitis vinifera* (European grape), *V. labrusca* (fox grape or concord grape) and *V. rotundifolia* (muscadine grape) (Sutton and Gibson 1977; Farr *et al.* 2001). *Greeneria uvicola* causes rot of grapevine berries resulting in soft, bitter-tasting and easily detached berries or in shrivelled berries (McGrew 1988; Momol *et al.* 2007; Taylor 2012). *Greeneria uvicola* can also cause leaf and twig blight, and girdling of shoots of grapevine (Ullasa and Rawal 1986; McGrew 1988). Marketability of diseased fruit, either for table or wine use, is reduced due to the bitter taste of the berries (McGrew 1988). *Greeneria uvicola* causes the most important berry rot disease of muscadine grapes in Mississippi (Kummuang *et al.* 1996b). Yields of muscadine grapes in North Carolina have been reduced by up to 30 per cent in the 1970s (Ridings and Clayton 1970). In an outbreak in India in 1977, 25 per cent of grape bunches of a *V. vinifera* variety and 30 per cent of the berries were infected. The market value of the bunches was greatly reduced (Reddy and Reddy 1983). The pathogen is generally limited to warm and humid climatic regions (McGrew 1988) with high summer and autumn rainfall (Ullasa and Rawal 1986; Kummuang *et al.* 1996a; Farr *et al.* 2001). In areas of Australia where *G. uvicola* occurs (NSW and Qld), there is high predisposition to infection in the eastern vineyards where relative humidity is high and little to no infection in the dryer inland central vineyards where the daytime temperatures are significantly higher (Steel and Greer 2008). Thus, its potential to affect grape production in Western Australia would be limited to areas with similar climatic conditions. Under experimental conditions, *G. uvicola* has also been shown to infect wounded fruit of apple, cherry, strawberry, peach, blueberry and banana causing fruit rot (Ridings and Clayton 1970). But the fungus is not known to cause problems on horticultural plants other than grapevine.
Other aspects of the environment	**Impact score**: A—Indiscernible at the local level. There are no known direct consequences of this fungus on other aspects of the natural environment.

Criterion	Estimate and rationale
Indirect	
Eradication, control etc.	**Impact score**: D—Significant at the district level. In Australia, chemical control measures are being developed to control bitter rot in affected regions (Steel 2007). The control of *G. uvicola* in warm wet regions in Australia includes avoiding the planting of late-maturing grape varieties (Emmett 2006). In the US, bitter rot disease is generally controlled by fungicides applied to control more serious/common diseases (McGrew 1988; Ellis 2008a). Fungicides effective against *G. uvicola* include captan, ferbam, maneb and strobilurin (McGrew 1988; Steel *et al.* 2012). Captan and a number of strobilurin fungicides are registered for use on grapevine in Australia (Essling and Francis 2012). However, some of these fungicides are likely to have withholding periods in Australia. Measures used to control *G. uvicola* in Japan include application of fungicide and cleanup of infected vines and fruits in the orchard (MAFF 2008a). Applications of additional fungicides and other control measures may be required to control *G. uvicola,* which would have costs associated with it.
Domestic trade	**Impact score**: A—Indiscernible at the local level. There would be no trade restrictions applied by other states as this fungus is present and there are no existing planting material controls for this pathogen.
International trade	**Impact score**: C—Minor significance at the district level. *Greeneria uvicola* is widely distributed (McGrew 1988). To date, *Greeneria uvicola* has been reported present in Australia (NSW, Qld), Brazil, Bulgaria, Costa Rica, Cuba, Greece, India, Japan, Mexico, New Zealand, Poland, South Africa, Taiwan, Thailand, Ukraine, Uruguay and the eastern US (Sutton and Gibson 1977; McGrew 1988; MAFF 1989b; Castillo-Pando *et al.* 1999; Sergeeva *et al.* 2001; NIAS 2013; Farr and Rossman 2013b). Its presence in commercial production areas of grapes in Western Australia would have impacts on the export of Western Australia's fresh grapes to countries where this pathogen is not present, or has a limited presence such as China.
Environmental and non-commercial	**Impact score**: B—Minor significance at the local level. Additional fungicide applications or other control measures would be required to control this disease on susceptible hosts and these may have minor impact on the environment.

4.15.6 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Greeneria uvicola*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Greeneria uvicola* has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.16 Black rot

Guignardia bidwellii[EP]

Black rot of grapevines is caused by the fungus *Guignardia bidwellii*, which has an almost cosmopolitan distribution except for Australasia, western North America and Scandinavia (Farr and Rossman 2009). *Guignardia bidwellii* causes an important disease of grapes affecting the foliage, petioles, shoots, tendrils, cluster stems and fruit (University of Illinois 2001; Ellis 2008b; Ullrich *et al.* 2009) that causes substantial economic loss (Ramsdell and Milholland 1988; Wilcox 2003).

Guignardia bidwellii overwinters in infected canes, tendrils, fallen leaves and in mummified fruit on the vine or on the ground (Ferrin and Ramsdell 1977; Kummuang *et al.* 1996a; Hartman and Hershman 1999; Ellis 2008b). Spring rains trigger the release of ascospores from pseudothecia, which are wind-borne and disperse moderate distances, and conidia from pycnidia, which are splash-dispersed short distances (centimetres to a metre). Mummified fruit on the ground release ascospores early and mummified fruit in the vine release spores up until the beginning of ripening of the new crop (Ferrin and Ramsdell 1977; Ferrin and Ramsdell 1978; Wilcox 2003).

Infection occurs when the spores land on young, immature tissues and these remain wet for a period of time (Spotts 1977). At 15 to 32 °C, spores can infect young plant tissue in less than 12 hours if a film of water is present on the vine surface (Ellis 2008b). It can take one to five weeks for symptoms to appear after infection depending on the plant part, time of infection and climatic conditions (Spotts 1980; Wilcox 2003). Once the fungus has become established in susceptible tissues, the anamorph, *Phyllosticta ampelicida*, is formed and production of conidia commences (Hartman and Hershman 1999). Conidia are splash-dispersed (Ferrin and Ramsdell 1978; University of Illinois 2001). Conidia are released in large quantities and can cause rapid spread of the disease (Ferrin and Ramsdell 1978). This cycle of conidial production and infection of susceptible hosts continues for the rest of the season, except when the environment becomes limiting (Hartman and Hershman 1999).

On fruit, symptoms initially show as small whitish dots (Eyres *et al.* 2006), which expand to encompass the whole berry and become light or chocolate brown. The berries then turn darker brown, produce pycnidia, then shrivel and turn into hard black mummified fruit (Wilcox 2003). The pycnidia, which are small, black fruiting bodies, appear as dots on the surface of infected tissue (Eyres *et al.* 2006).

Fruit is very susceptible to infection for the first two to three weeks after cap fall and berries of *V. vinifera* cultivars remain susceptible at a reduced level until six to seven weeks after bloom (Wilcox 2003). Fruit generally starts showing symptoms about two weeks after it becomes infected but berries infected near the end of their period of susceptibility do not show symptoms until at least three weeks later and do not begin to rot until four to five weeks after the infection event (Wilcox 2003).

The risk scenario of concern for *G. bidwellii* is that low levels of berry infection, especially berries infected near the end of their period of susceptibility, may escape detection during picking and packing of grape bunches and hence may be present on imported grape bunches.

Guignardia bidwellii was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a). The assessment of *Guignardia bidwellii* presented here builds on this existing policy.

The probability of importation for *Guignardia bidwellii* was rated as ‘high’ in the assessment for table grapes from China.

The probability of distribution for *Guignardia bidwellii* was rated as ‘moderate’ in the assessment for table grapes from China. The probability of distribution after arrival in Australia of *Guignardia bidwellii* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *Guignardia bidwellii* will be imported into Australia with table grapes from Japan.

4.16.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Guignardia bidwellii* will arrive in Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Guignardia bidwellii* is a recognised pathogen of grapes in Japan (MAFF 1989b; NIAS 2012).
- *Guignardia bidwellii* has been reported present in the Shizuoka, Okayama and Yamaguchi prefectures on Honshu island of Japan (Kobayashi 2007).
- *Guignardia bidwellii* is an important disease of grapes. In areas with warm, humid climates, it can cause severe crop loss (Wilcox 2003). The climate in Japan varies widely from one region to another, from cool temperate in the north to subtropical in the south. Central Japan has hot, humid summers (Long 1994) which would be a suitable environment for the development of black rot. Japan is generally regarded as a rainy country with high humidity (MLIT 2012). The percentage of grapes grown in Japan where the symptoms or crop loss would be severe is unknown.
- All common cultivars of *V. vinifera* are susceptible to *G. bidwellii* (Wilcox 2003), but there is variability in the level of susceptibility of cultivars (University of Illinois 2001).
- There is variation in the pathogen and several forms have been described (Luttrell 1946; Kummuang *et al.* 1996b; AQIS 2000).
- All young green tissues of the vine are susceptible to infection by *G. bidwellii* and the fungus infects the cluster stems and berries (University of Illinois 2001; Ellis 2008b; Ullrich *et al.* 2009).

- Berries are very susceptible to infection for the first two to three weeks after cap fall and remain susceptible at a reduced level until six to seven weeks after bloom (Wilcox 2003).
- Fruit generally starts showing symptoms about two weeks after it becomes infected but berries infected near the end of their period of susceptibility (that is six to seven weeks after bloom) do not show symptoms until at least three weeks later and do not begin to rot until four to five weeks after the infection event (Wilcox 2003). Taking these timeframes into account, symptoms on infected fruit would in most cases show at harvest time.
- On the fruit, symptoms start as light brown, soft spots that rapidly enlarge to cover the entire berry. These symptoms are easily visible. Affected berries, covered with pycnidia, shrivel into black, wrinkled mummified fruit which either drop to the ground or remain in clusters (Hartman and Hershman 1999).
- The proportion of berry infection in a vineyard ranged from 5 to 58 per cent in the USA (Spotts 1980).
- Most inferior or defective grapes are likely to be trimmed and removed from bunches of table grapes during harvesting and packing processes. However, it is possible that a small proportion of late infected berries may exhibit mild symptoms and may escape detection. Bunches with berries missing are unlikely to be packed for export.

The susceptibility of all commercial cultivars of *V. vinifera* to infection and the possibility that late infected berries with mild symptoms may escape detection, moderated by the limited distribution of this pest in Japan and the fact that most infections occur early in the growing season and symptoms on fruit including rots would show at harvest time and hence be removed during harvesting or packing processes, support a likelihood estimate for importation of ‘moderate’.

Probability of distribution

As indicated above, the probability of distribution for *Guignardia bidwellii* assessed here would be the same as that for *Guignardia bidwellii* for table grapes from China (Biosecurity Australia 2011a), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Guignardia bidwellii* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.16.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *Guignardia bidwellii* would be the same as that for *Guignardia bidwellii* for table grapes from China (Biosecurity Australia 2011a). That assessment used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessment are presented below:

Probability of establishment: **Moderate**

Probability of spread: **High**

4.16.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Guignardia bidwellii* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.16.4 Consequences

The consequences of the establishment of *Guignardia bidwellii* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a). This estimate of impact scores is provided below:

Plant life or health	**F**
Other aspects of the environment	**A**
Eradication, control	**E**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one criterion is '**F**', the overall consequences for *Guignardia bidwellii* are estimated to be: **High**.

4.16.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Guignardia bidwellii*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**High**
Unrestricted risk	**Moderate**

As indicated, the unrestricted risk estimate for *Guignardia bidwellii* has been assessed as 'moderate' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.17 Brown rot

Monilinia fructigena[EP] *and Monilia polystroma*

Brown rot, caused by *Monilinia fructigena*, is a common fungal disease of pome and stone fruit. *Monilinia fructigena* has also been reported on other hosts including grapes (Byrde and Willets 1977; Cline and Farr 2006; CABI 2011). Symptoms caused by brown rot fungi include blossom and leaf blight, cankers on woody tissues and rotting of fruit (Byrde and Willets 1977). However, *Monilinia fructigena* primarily infects fruit, rarely blossoms and twigs (Farr and Rossman 2012).

Monilia polystroma is a newly recognised species named after its intense stromata formation. Some Japanese isolates formerly described as *Monilinia fructigena*, were identified as a distinct species *Monilia polystroma* in 2002 (van Leeuwen *et al.* 2002). Only the anamorph *Monilia polystroma* has been identified to date.

Monilia polystroma has been recorded from Japan, China, Hungary, the Czech Republic and Switzerland (van Leeuwen *et al.* 2002; Petróczy and Palkovics 2009; Zhu and Guo 2010; EPPO 2011a; Hilber-Bodmer *et al.* 2012). It has been shown to infect species of *Malus*, *Prunus* and *Pyrus* (van Leeuwen *et al.* 2002; Petróczy and Palkovics 2009; Zhu and Guo 2010).

Monilia polystroma is closely related and very similar to *Monilinia fructigena* (van Leeuwen *et al.* 2002; Côté *et al.* 2004). Biological differences between the two species seem small, although morphological and molecular differences exist (Fulton *et al.* 1999; van Leeuwen *et al.* 2002).

Monilinia fructigena and *Monilia polystroma* have been grouped together because of their related biology and taxonomy, and are predicted to pose a similar risk and to require similar mitigation measures. To date, there is little information available on *Monilia polystroma*. The assessment of the two pathogens presented here has been largely based on the scientific information on *Monilinia fructigena*. Unless explicitly stated, the information presented is considered as applicable to both species. In this section, the common name brown rot is used to refer to both species. The scientific name is used when the information is about a specific species.

Monilinia fructigena is a pathogen favoured by moist conditions (rain, fog and other factors that increase humidity), especially at the beginning of the host's growth period. Brown rot fungi overwinter mainly in or on infected mummified fruit, either attached to the tree or on the ground (Byrde and Willets 1977). Mycelia can survive long periods of adverse environmental conditions within mummified fruits, twigs, cankers and other infected tissues. In spring or early summer when temperature, day length, moisture conditions and relative humidity are suitable for sporulation, sporodochia are formed on the surface of mummified fruit and other infected tissues and bear chains of conidia (Byrde and Willets 1977; Jones 1990). The anamorph of *Monilinia* fungi is referred to as the *Monilia* state (Batra 1991). The conidia of *Monilinia fructigena* are dry airborne spores, transported by wind, water or insects to young fruit (Jones 1990; Batra 1991). Initial infection can be via wounds caused by any number of causes or on sound fruit and subsequent spread by contact between adjacent fruit is possible (Byrde and Willets 1977). Infected tissue can produce several crops of conidia throughout the year which can initiate secondary infection (Batra 1991).

There are only a few records of the development of fruiting bodies (apothecia) of *Monilinia fructigena*, which are produced in spring on mummified fruit that have overwintered on the ground (Byrde and Willets 1977; Batra and Harada 1986). The liberation of ascospores from apothecia normally coincides with the emergence of young shoots and blossoms of plants (Byrde and Willets 1977).

The risk scenario of concern for *Monilinia fructigena* and *Monilia polystroma* is that symptomless infected grape bunches may be imported into Australia.

Monilinia fructigena was included in several existing import policies, for example in the policies for apples from China (Biosecurity Australia 2010a), table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b). The assessment of *Monilinia fructigena* and *Monilia polystroma* presented here builds on these existing policies, particularly on the policies for apples from China (Biosecurity Australia 2010a) and table grapes from China (Biosecurity Australia 2011a).

The probability of importation for *Monilinia fructigena* was rated as 'high' in the assessment for apples from China (Biosecurity Australia 2010a), 'low' in the assessment for table grapes from China (Biosecurity Australia 2011a) and 'very low' in the assessment for table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *Monilinia fructigena* was rated as 'high' in the assessments for table grapes from China (Biosecurity Australia 2011a) and from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of the assessed species will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that the assessed species will be imported into Australia with table grapes from Japan.

4.17.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that the assessed species will arrive in Australia with the importation of table grapes from Japan is: **Low**.

Supporting information for this assessment is provided below:

- *Monilinia fructigena* is recorded on a number of hosts in Japan, including grapes (Kobayashi 2007; NIAS 2012). Its anamorph, *Monilia fructigena*, has been reported on grape berries in Japan (Ogata *et al.* 1999).
- *Monilinia fructigena* is present on Hokkaido and Honshu (Aomori, Iwate, Fukushima, Kyoto and Osaka prefectures) in Japan (Kobayashi 2007).
- Grapevine has been reported as a minor host of *Monilinia fructigena* (CABI 2011) but information on its biology on grapevine has not been found.

- No reports of economic losses to table grape production in Japan caused by the assessed species were found. Lack of published information on losses caused by *Monilinia fructigena* and *Monilia polystroma* on grapevine also indicate that grape is not a preferred host.
- To date, *Monilia polystroma* has only been isolated from apple in Japan (van Leeuwen *et al.* 2002). However, reports in Japan previously considered to be *Monilia fructigena*, the anamorph state of *Monilinia fructigena*, probably refer to *Monilia polystroma* (Farr and Rossman 2012; Cline 2012).
- The mycelia of brown rot fungi survive long periods under adverse environmental conditions, for example winter, within mummified fruit, infected twigs, cankers and other infected tissues (Byrde and Willets 1977). This suggests that the fungi may survive cold storage and transportation processes.
- At harvest, apparently healthy fruit can be contaminated with conidia (DAFF and MAF Biosecurity New Zealand 2008). Wounded fruit may also be contaminated with conidia during packing processes. Fruit rots develop during the postharvest period (Byrde and Willets 1977).
- *Monilinia fructigena* has the ability to cause latent infections in fruit. The infected fruit does not produce symptoms of disease until the fruit begins to ripen during storage and transport, on the market shelf, or as the fruit senesces (Byrde and Willets 1977).

The potential for latent infection and symptomless infected fruit passing through packing processes, moderated by the minor host status of grapes for these fungi and the absence of reports of economic damage to grapevine in Japan, support a likelihood estimate for importation of 'low'.

Probability of distribution

As indicated above, the probability of distribution for *Monilinia fructigena* and *Monilia polystroma* assessed here would be the same as that for *Monilinia fructigena* for table grapes from China (Biosecurity Australia 2011a), that is **High**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that the assessed species will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.17.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *Monilinia fructigena* and *Monilia polystroma* assessed here would be the same as that for *Monilinia fructigena* for apples from China (Biosecurity Australia 2010a), which was adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **High**

Probability of spread:	**High**

4.17.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Monilinia fructigena* and/or *Monilia polystroma* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.17.4 Consequences

The consequences of the establishment of *Monilinia fructigena* in Australia have been estimated previously for apples from China (Biosecurity Australia 2010a) and were adopted for table grapes from China (Biosecurity Australia 2011a) and Korea (Biosecurity Australia 2011b). The previous estimate of impact scores for *Monilinia fructigena* for apples from China is adopted for both *Monilinia fructigena* and *Monilia polystroma* for table grapes from Japan. This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**B**
Eradication, control	**E**
Domestic trade	**E**
International trade	**E**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for the assessed species are estimated to be: **Moderate**.

4.17.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Monilinia fructigena* and *Monilia polystroma*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *Monilinia fructigena* and *Monilia polystroma* has been assessed as 'moderate' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for these pests.

4.18 Fruit rot

Pestalotiopsis menezesiana[WA] and *Pestalotiopsis uvicola*[WA]

Pestalotiopsis menezesiana and *Pestalotiopsis uvicola* are plant pathogenic fungi that cause fruit rot of grapevine (Mishra *et al.* 1974; Xu *et al.* 1999). In Japan, these two species have been found on grape bunches (Xu *et al.* 1999).

Pestalotiopsis menezesiana and *Pestalotiopsis uvicola* have been grouped together as the two species cause a similar disease and their biology is likely to be very similar, and they are predicted to pose a similar risk and to require similar mitigation measures. Unless explicitly stated, the information presented is considered as applicable to both species. In this section, the common name fruit rot is used to refer to both species. The scientific name is used when the information is about a specific species.

Pestalotiopsis menezesiana and *Pestalotiopsis uvicola* are not known to be present in Western Australia and are pests of quarantine concern for that state. In Australia, *P. menezesiana* is known to be present in NSW (Plant Health Australia 2001b; Sergeeva *et al.* 2005) and *P. uvicola* in NSW and Qld (Plant Health Australia 2001b).

On *Vitis* spp., both assessed fungi have mainly been reported on *Vitis vinifera* (Guba 1961; Kobayashi 2007). *Pestalotiopsis uvicola* has also been reported on *V. coignetia*, *V. indivisa* and *V. labrusca* (Guba 1961; Kobayashi 2007; Farr and Rossman 2013b). Both fungi have been reported on leaves, canes and fruit of *Vitis* spp. (Mundkur and Thirumalachar 1946; Guba 1961; Mishra *et al.* 1974; Bissett 1982; Nag Raj 1993; Sergeeva *et al.* 2005; MAFF 2008a). *Pestalotiopsis uvicola* has also been isolated from flowers, cankers and internal wood rot of grapevine, and has been associated with grapevine trunk disease (Sergeeva *et al.* 2005; Úrbez-Torres *et al.* 2009; Úrbez-Torres *et al.* 2012).

In addition to *Vitis* spp., *P. menezesiana* has also been reported to cause leaf spot of kiwifruit (*Actinidia chinensis*) and plantain (*Musa paradisiaca*), and rot of cuttings of grape ivy (*Cissus rhombifolia*) (Bissett 1982; Park *et al.* 1997; Huang *et al.* 2007). It was also isolated from leaves of wilted pineapple plants (*Ananas comosus*) (Watanabe and Tsudome 1970). *Pestalotiopsis uvicola* has been reported to cause leaf spot and stem blight of bay laurel (*Laurus nobilis*), stem blight of Kermandac pohutukawa (*Metrosideros kermadecensis*) and leaf spot of mango (*Mangifera indica*) and carob (*Ceratonia siliqua*) (Vitale and Polizzi 2005; Grasso and Granata 2008; Ismail *et al.* 2013; Carrieri *et al.* 2013).

On grapevine bunches in India, symptoms of *P. menezesiana* first appear near the peduncle when the fruit is about to ripen and cover the upper portion of the fruit within two days (Mishra *et al.* 1974). The lesions first appear water-soaked and then turn Sienna colour (yellow-brown or reddish-brown) with numerous acervuli (Mishra *et al.* 1974). Lesions are irregular and the acervuli are raised in severe cases (Mishra *et al.* 1974). The skin of the berry becomes brownish-black and leathery, and bunches become completely unmarketable (Mishra *et al.* 1974).

In inoculation studies, both *P. menezesiana* and *P. uvicola* can infect both injured and uninjured grape berries under laboratory conditions (Mishra *et al.* 1974; Xu *et al.* 1999). However, uninjured berries inoculated with *P. menezesiana* showed rot after four days (at 25 °C) whereas uninjured berries inoculated with *P. uvicola* only showed rot after two weeks

(Xu *et al.* 1999). This indicates that the pathogenicity of *P. uvicola* on grape berries might be weaker than that of *P. menezesiana*. Xu *et al.* (1999) reported that both *P. menezesiana* and *P. uvicola* were isolated from damaged grape bunches at harvest or at the markets, as well as from healthy tissue of both mature and immature grape bunches in the vineyard. The authors suggest that this may indicate the ability of these pathogens to cause latent infection.

Pestalotiopsis menezesiana, like many other species of *Pestalotiopsis*, has also been reported on dead or dying plant material (Guba 1961; Nag Raj 1993) and both assessed fungi have been isolated as endophytes on conifer trees in China (Liu *et al.* 2007; Liu *et al.* 2013).

Infection of *Pestalotiopsis* spp. can occur from a resting endophytic stage, mycelium, ascospores or conidium on healthy tissue (Maharachchikumbura *et al.* 2011). The infection develops into enlarging, circular to irregular lesions that contain either pycnidia or perithecia. Spores are then released to continue the infection (Maharachchikumbura *et al.* 2011). However, the sexual stage does not often develop and thus conidia (asexual spores) are thought to provide the inocula (Maharachchikumbura *et al.* 2011).

Pestalotiopsis menezesiana and *P. uvicola* reproduce through conidia (Guba 1961; Bissett 1982). Conidia of the assessed fungi are dispersed by rain splash or wind (MAFF 2008a; Maharachchikumbura *et al.* 2011).

The risk scenario of concern for the assessed fungi is that symptomless infected grape bunches may be imported into Western Australia.

4.18.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will arrive in Western Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Pestalotiopsis menezesiana* and *P. uvicola* are present on grapevine in Japan (Xu *et al.* 1999; Kobayashi 2007; MAFF 2008a; NIAS 2012). *Pestalotiopsis menezesiana* has been reported from Mie, Nara, Niigata, Okayama, Osaka, Shimane, Tottori and Yamanashi prefectures (Xu *et al.* 1999; Kobayashi 2007). It was also isolated from leaves of wilted pineapple plants (*Ananas comosus*) in Okinawa (Watanabe and Tsudome 1970). *Pestalotiopsis uvicola* has been reported from Tokyo-Hachijojima and Tokyo-Oshima islands, and Osaka, Nara, Okayama and Hiroshima prefectures (Kobayashi 2007).
- On grapevine, grape clusters are among tissues that can be infected by the assessed fungi (Mishra *et al.* 1974; Bissett 1982; Xu *et al.* 1999; MAFF 2008a).
- When grape berries of different maturity stages were punctured and inoculated with *P. menezesiana*, the rates of infection were: 20.0 per cent for raw berries, 93.3 per cent for semi-ripe berries and 55.3 per cent for fully ripe berries (Mishra *et al.* 1974). Symptoms of infection develop more quickly on mature berries. Rot symptoms were visible after four days for ripe berries and after nine days for semi-ripe berries (Mishra *et al.* 1974).

- Infection also occurred on uninjured berries inoculated with the assessed fungi (Mishra *et al.* 1974; Xu *et al.* 1999), but at lower infection rates compared to injured berries (Mishra *et al.* 1974). Inoculation onto healthy uninjured berries caused rot after four days at 25 °C for *P. menezesiana* and after two weeks at the same temperature for *P. uvicola* (Xu *et al.* 1999), suggesting that the pathogenicity of *P. uvicola* on grape berries might be weaker than that of *P. menezesiana*.
- Inoculation studies with injured grape berries indicate that colony formation/growth of the assessed fungi and decay of berries seems to be highest at the temperature range of 20–30 °C (Xu *et al.* 1999).
- Symptoms on grape clusters are obvious. In India, symptoms of *P. menezesiana* first appear near the peduncle when the fruit is about to ripen and cover the upper portion of the fruit within two days (Mishra *et al.* 1974). The lesions first appear water-soaked and then turn Sienna colour (yellow-brown or reddish-brown) with numerous acervuli (Mishra *et al.* 1974). Lesions are irregular and the acervuli are raised in severe cases (Mishra *et al.* 1974). The skin of the berry becomes brownish-black and leathery, and bunches become completely unmarketable (Mishra *et al.* 1974).
- Diseased grape clusters showing obvious symptoms are likely to be removed from the export pathway during harvesting and/or packing processes.
- In Japan, the assessed fungi have been isolated from healthy tissue of both mature and immature grape bunches in the vineyard and were also detected on damaged fruit in markets (Xu *et al.* 1999). Although the authors suggested that these fungi could potentially cause latent infection and a post-harvest disease of grapes (Xu *et al.* 1999), they did not report if latent infection still occurs at harvest or investigate the condition at harvest of the damaged fruit in markets where the assessed fungi were isolated from.
- As symptoms of the assessed fungi develop quickly on mature berries, it could be expected that any infected berries that were picked and packed for export via sea freight would show symptoms by the time they arrive in Western Australia. Grape bunches showing symptoms would be detected during routine inspection on arrival.
- However, grapes are usually stored and transported at low temperatures to prolong shelf life. Detailed information on the time for symptoms to develop under cold storage conditions could not be found, but the study by Xu *et al.* (1999) indicates that symptoms develop more slowly at low temperatures. Grape bunches without symptoms, or with only minor symptoms, may not be detected at routine inspection on arrival.

The wide distribution of the assessed fungi in Japan and the uncertainty if latent infection still occurs at the time grapes are harvested, moderated by the fact that symptoms of the assessed fungi develop quickly on mature berries and that grape clusters showing obvious symptoms are likely to be removed from the export pathway, support a likelihood estimate for importation of ‘moderate’.

Probability of distribution

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will be distributed within Western Australia in a viable state as a result of the processing, sale or disposal of table grapes from Japan and subsequently transfer to a susceptible part of a host is: **Very low**.

Supporting information for this assessment is provided below:

- Imported grapes are intended for human consumption. Based on Japan's limited export capability, it is expected that volumes of table grapes from Japan to Australia per year will be very low. As a result, the majority of imported grape bunches is likely to be distributed by wholesale trade to the major cities. However, there is a possibility that a proportion of imported grape bunches is distributed by retail trade to areas outside the major cities. Also, there is potential for individual consumers to distribute a small proportion of imported grape bunches to many localities within the state.
- As grapes are easily damaged during handling (Mencarelli *et al.* 2005), packed grapes may not be processed or handled again until they arrive at the retailers. Therefore, pathogens in packed grapes are unlikely to be detected during transportation and distribution to retailers.
- It could be expected that infected berries would show symptoms by the time they arrive at the retailers. Grape bunches with obvious symptoms of infection would not be marketable and would not be sold. If grapes are transported at low temperatures, symptoms may develop more slowly. Grape bunches without symptoms or with only minor symptoms, could be marketable and sold.
- Most fruit waste will be discarded into managed waste systems and will be disposed of in municipal tips and would therefore pose little risk of exposure to a suitable host.
- Consumers will discard small quantities of fruit waste in urban, rural and natural localities. Small amounts of fruit waste will be discarded in domestic compost. There is some potential for consumer waste being discarded near host plants, including commercially grown, household or wild host plants. If present in fruit waste, the assessed fungi would then need to be transferred to a susceptible host.
- *Pestalotiopsis menezesiana* and *P. uvicola* reproduce through conidia (Guba 1961; Bissett 1982). Conidia are produced at 13–28 °C, with the most conidia produced at 22 °C (Huang *et al.* 2007). Conidia of the genus *Pestalotiopsis* are dispersed by rain splash or wind-blown droplets (MAFF 2008a; Maharachchikumbura *et al.* 2011).
- If present in fruit waste, the conidia would then need to be transferred from the fruit waste in water droplets to susceptible host tissue. This transmission is limited to a short distance for fruit waste on the ground.
- For both fungi, germination of conidia occurred at 10–33 °C and no germination was observed at 35 °C or higher (Xu *et al.* 1999). Optimum temperature for germination of conidia was 25 °C for *P. menezesiana* and 23–25 °C for *P. uvicola* (Xu *et al.* 1999).
- *Pestalotiopsis menezesiana* overwintered in diseased leaves of kiwifruit on the ground in Korea (Park *et al.* 1997).
- Members of the genus *Pestalotiopsis* are generally not very host specific (Maharachchikumbura *et al.* 2011). The known hosts of *P. menezesiana* include *Actinidia chinensis* (kiwifruit) (Park *et al.* 1997), *Cissus rhombifolia* (grape-ivy) (Bissett 1982), *Vitis vinifera* (grapevine) (Mishra *et al.* 1974; Xu *et al.* 1999) and *Musa paradisiaca* (plantain) (Huang *et al.* 2007). The known hosts of *P. uvicola* include *Ceratonia siliqua* (carob) (Carrieri *et al.* 2013), *Laurus nobilis* (bay laurel) (Vitale and Polizzi 2005), *Macademia integrifolia* (macademia nut), *Mangifera indica* (mango) (Ismail *et al.* 2013), *Metrosideros kermadecensis* (Kermandac pohutukawa) (Grasso and Granata 2008), *Vitis coignetia, V. indivisa, V. labrusca* and *V. vinifera* (Guba 1961; Xu *et al.* 1999; Kobayashi 2007; Farr and Rossman 2013b). A more comprehensive list of hosts is presented in

Appendix B. Many of these hosts are grown in Western Australia, some of these are grown commercially such as grapevine, mango and kiwifruit.

- Generally Japanese fresh grapes are exported from June to December, with the peak volumes occurring in August–October (ITC Comtrade 2012) (late winter to mid spring in Australia). The assessed fungi can infect leaves, canes and fruit of *Vitis* spp. (Mundkur and Thirumalachar 1946; Guba 1961; Mishra *et al.* 1974; Bissett 1982; Nag Raj 1993; Sergeeva *et al.* 2005; MAFF 2008a). Grapevines in Western Australia would be susceptible to infection during parts of the expected export window. Other hosts of the assessed fungi may also be susceptible to infection during the expected export window.
- In inoculation studies, *P. menezesiana* was able to form fungal colonies at temperatures as low as 5 °C in four days (Xu *et al.* 1999). Cooling of grape bunches during transport and storage is unlikely to affect the viability of the assessed fungi.

The availability of host plants in Western Australia, moderated by the limited potential for dispersal of conidia via rain splash from fruit waste to a susceptible part of a host, the short time required for symptoms to develop on mature bunches and subsequent removal of such bunches from being sold, and the fact that very low volumes, if any, of imported grape bunches will be distributed within Western Australia, support a likelihood estimate for distribution of ‘very low’.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.18.2 Probability of establishment

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will establish within Western Australia, based on a comparison of factors in the source and destination areas that affect pest survival and reproduction, is: **High**.

Supporting information for this assessment is provided below:

- Members of the genus *Pestalotiopsis* are not very host specific (Maharachchikumbura *et al.* 2011) and there is a range of available hosts of the assessed fungi, in addition to grapevine, as discussed under probability of distribution. A more comprehensive list of hosts is presented in Appendix B. Many of these hosts are grown in Western Australia and some of these are grown commercially such as grapevine, mango and kiwifruit.
- For both fungi, germination of conidia occurred at 10–33 °C and no germination was observed at 35 °C or higher (Xu *et al.* 1999). Optimum temperature for germination of conidia was 25 °C for *P. menezesiana* and 23–25 °C for *P. uvicola* (Xu *et al.* 1999). Under laboratory conditions, the optimum temperature for hyphal growth was 23 °C for *P. menezesiana* and 25 °C for *P. uvicola*, from a tested range of 5–40 °C (Xu *et al.* 1999). In another study, the temperature range for growth of *P. menezesiana* was 10–34 °C (Huang *et al.* 2007).

- These parameters indicate that climatic conditions within areas of Western Australia would be favourable to the establishment of the assessed fungi.
- *Pestalotiopsis menezesiana* and *P. uvicola* reproduce through five-celled conidia (Guba 1961; Bissett 1982). Conidia were produced at 13–28 °C, with the most conidia produced at 22 °C (Huang *et al.* 2007). Conidia produced on an infected plant could transfer to other nearby host plants via rain splash or wind-blown droplets.
- Both pathogens are established in parts of eastern Australia (Plant Health Australia 2001a; Plant Health Australia 2001b), which indicates the potential for these species to establish in Western Australia.
- Other species of *Pestalotiopsis* are established in Western Australia (Plant Health Australia 2001a), indicating the suitability of the Western Australian environment for these fungi.

The availability of host plants and suitable climatic conditions in various parts of Western Australia support a likelihood estimate for establishment of 'high'.

4.18.3 Probability of spread

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will spread within Western Australia, based on a comparison of factors in source and destination areas that affect the expansion of the geographic distribution of the pest, is: **High**.

Supporting information for this assessment is provided below:

- Members of the genus *Pestalotiopsis* are generally not very host specific (Maharachchikumbura *et al.* 2011) and there is a range of available hosts of the assessed fungi, in addition to grapevine, as discussed under probability of distribution. A more comprehensive list of hosts is presented in Appendix B. Many of these hosts are grown in Western Australia and some of these are grown commercially such as grapevine, mango and kiwifruit.
- *Pestalotiopsis menezesiana* has been reported present in Australia (NSW), Brazil, Canada, China, India, Japan, Korea, the Madeira Islands and Portugal (Guba 1961; Mishra *et al.* 1974; Bissett 1982; Tomaz and Rego 1990; Park *et al.* 1997; Xu *et al.* 1999; Plant Health Australia 2001a; Sergeeva *et al.* 2005; Huang *et al.* 2007). *Pestalotiopsis uvicola* has been reported present in Australia (NSW and Qld), Brazil, China, France, India, Italy, Japan, Korea and the US (Guba 1961; Plant Health Australia 2001b; Farr and Rossman 2013b). Environments with climates similar to these regions exist in some parts of Western Australia, indicating the potential of the assessed fungi to spread in Western Australia.
- Conidia of the assessed fungi are disseminated by rain splash or wind-blown droplets (Nag raj 1993). Infected host fruit may be distributed throughout Western Australia for human consumption. The movement of infected propagation material or nursery stock may also contribute to spreading the assessed fungi to new areas.

The suitable climatic conditions and the availability of host plants in various parts of Western Australia support a likelihood estimate for spread of 'high'.

4.18.4 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Very low**.

4.18.5 Consequences

The consequences of the establishment of *Pestalotiopsis menezesiana* and/or *Pestalotiopsis uvicola* in Western Australia have been estimated according to the methods described in Table 2.3.

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for *Pestalotiopsis menezesiana* and *Pestalotiopsis uvicola* are estimated to be: **Low**.

Reasoning for these ratings is provided below:

Criterion	Estimate and rationale
Direct	
Plant life or health	**Impact score**: D—Significant at the district level. *Pestalotiopsis menezesiana* causes fruit rot and leaf spot of grapevine, leaf spot of kiwifruit and plantain and rot of cuttings of grape ivy (Mishra *et al.* 1974; Bissett 1982; Park *et al.* 1997; Xu *et al.* 1999; Huang *et al.* 2007). It has also been reported on canes of grapevine (Guba 1961; MAFF 2008a). On grapevine in India, symptoms first appear near the peduncle when the fruit is about to ripen and cover the upper portion of the fruit within two days (Mishra *et al.* 1974). The lesions first appear water-soaked and then turn Sienn's colour with numerous acervuli (Mishra *et al.* 1974). The skin of the berry becomes brownish-black and leathery, and bunches become completely unmarketable (Mishra *et al.* 1974). On plantains in China, the lesions on leaves started as water-soaked, then turned black-brown and at a later stage elliptical or irregularly shaped grey with golden yellow margins (Huang *et al.* 2007). In India, *P. menezesiana,* together with *Phakopsora vitis,* has been reported to cause considerable damage to grapevine by speeding up defoliation (Mundkur and Thirumalachar 1946). Grapes are grown commercially in Western Australia. In 2008, there were close to 13 000 hectares of grapes grown in Western Australia (ABS 2009b). More than 90 per cent of Australia's bananas are grown in Queensland (ABGC 2013). Almost all bananas produced in Australia are for domestic consumption (Biosecurity Australia 2008). Plantains, a type of cooking banana, make up a residual proportion of Australia's banana production (way below 5 per cent) (Biosecurity Australia 2008). In 2011, there were 223 hectares of commercial bananas grown in Western Australia (ABS 2012) and commercial banana production areas are Carnarvon and Kununurra (Shivas *et al.* 1995). Until the 1960s, plantain plants were commonly used as windbreaks around banana plantations in Carnarvon (Shivas *et al.* 1995). In 2010–11, Western Australia produced 1681 tonnes of mangoes (ABS 2012). Mangoes are also commonly grown in gardens in Western Australia (Burt and Johnson 2006). The kiwifruit industry in Western Australia is small, with about 328 tonnes being produced in 2008 (Keogh *et al.* 2010). Both kiwifruit and grapevine are commonly grown in gardens in Western Australia (Waldecks 2013). *Pestalotiopsis uvicola* has been isolated from both cankers and bleached canes of grapevine and has been shown to be able to infect and colonise woody tissues of grapevine (Úrbez-Torres *et al.* 2009). Together with many other fungi*, P. uvicola* has been associated with grapevine trunk disease (Úrbez-Torres *et al.* 2012). However, inoculation studies indicate that the pathogenicity of *P. uvicola* is not very high, compared to other fungi (Úrbez-Torres *et al.* 2012). *Pestalotiopsis uvicola* has been reported to cause rot of grape bunches (Xu *et al.* 1999), leaf spot and stem blight of bay laurel (*Laurus nobilis*) (Vitale and Polizzi 2005), stem blight of Kermandac pohutukawa (*Metrosideros kermadecensis*) (Grasso and Granata 2008) and leaf spot of mango (*Mangifera indica*) and carob (*Ceratonia siliqua*) (Ismail *et al.* 2013; Carrieri *et al.* 2013). A study by Xu *et al.* (1999) indicates that the pathogenicity of *P. uvicola* on grape berries is likely to be weaker than that of *P. menezesiana*. No information was found on the extent of economic damage caused by *P. uvicola*. The pathogen is often found together with other pathogens and therefore its contribution to the economic damage is difficult to estimate. For example, its association with grey leaf spot of mango in Sicily was described together with *P. clavispora,* which showed higher pathogenicity in inoculation studies than *P. uvicola* (Ismail *et al.* 2013).
Other aspects of the environment	**Impact score**: A—Indiscernible at the local level. There are no known direct consequences of the assessed fungi on other aspects of the natural environment.
Indirect	
Eradication, control etc.	**Impact score**: B—Minor significance at the local level. Measures to control *P. menezesiana* include application of fungicide, removal of dead and diseased plant parts from vines and removal of diseased plant material from orchards (MAFF 2008a). Control measures for *P. uvicola* are expected to be similar. Several fungicides are known to control *P. menezesiana*: captan, iprodione, prochloraz, thiabendazole and triazole (Hedge *et al.* 1969; Huang *et al.* 2007). Captan and iprodione are registered for use on grapevine in Australia (Essling and Francis 2012). Any measures applied to control other species of *Pestalotiopsis*, such as *P. mangiferae* which is known to be present in Western Australia, are also likely to control *P. menezesiana* and *P. uvicola.*
Domestic trade	**Impact score**: A—Indiscernible at the local level. There would be no trade restrictions applied by other states as *P. menezesiana* is present in NSW (Plant Health Australia 2001a; Sergeeva *et al.* 2005) and *P. uvicola* in NSW and Qld (Plant Health Australia 2001b). There are currently no restrictions on trade to grape producing states due to these pathogens.

Criterion	Estimate and rationale
International trade	**Impact score**: B—Minor significance at the local level. *Pestalotiopsis menezesiana* has been reported present in Australia (NSW), Brazil, Canada, China, India, Japan, Korea, the Madeira Islands and Portugal (Guba 1961; Mishra *et al.* 1974; Bissett 1982; Tomaz and Rego 1990; Park *et al.* 1997; Xu *et al.* 1999; Plant Health Australia 2001a; Sergeeva *et al.* 2005; Huang *et al.* 2007). *Pestalotiopsis uvicola* has been reported present in Australia (NSW and Qld), Brazil, China, France, India, Italy, Japan, Korea and the US (Guba 1961; Plant Health Australia 2001b; Farr and Rossman 2013b). The presence of *P. menezesiana* and/or *P. uvicola* in commercial production areas of table grapes, or of any other commercial hosts, in Western Australia could limit access to overseas markets that are free of these pathogens. To date, kiwifruit and bananas (including plantain) are only produced for domestic consumption in Australia (Biosecurity Australia 2008; Keogh *et al.* 2010). Mango production in Western Australia is small (ABS 2012). *Pestalotiopsis uvicola* is a regulated quarantine pest for table grapes from Italy to New Zealand, but the only risk management measure required for this pathogen is that consignments must be free from trash (MAF Biosecurity New Zealand 2002). No information was found on *P. menezesiana* being declared a regulated quarantine pest anywhere else.
Environmental and non-commercial	**Impact score**: B—Minor significance at the local level. Additional fungicide applications or other control measures may be required to control the assessed fungi on susceptible hosts and these may have a minor impact on the environment.

4.18.6 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Pestalotiopsis menezesiana* and *Pestalotiopsis uvicola*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Pestalotiopsis menezesiana* and *Pestalotiopsis uvicola* has been assessed as ‘negligible’, which achieves Australia’s ALOP. Therefore, no specific risk management measures are required for these pests.

4.19 Grapevine leaf rust

Phakopsora euvitis[EP]

The pathogen responsible for grapevine leaf rust in Asia is *Phakopsora euvitis*, not *Phakopsora ampelopsidis* or *Phakopsora vitis* that are restricted to other host plants (Ono 2000; EPPO 2002). *Phakopsora euvitis* is the name proposed by Ono (Ono 2000) for the species that causes leaf rust of cultivated grapes in Asia.

Before 2000, records in the literature identified the grape leaf fungus present in Asia as *Phakopsora ampelopsidis*. Work by Ono in Japan (Ono 2000), based on morphological characteristics, identified three populations differing in life cycle and host specificity as three separate species. The species occurring on grapes was described as the new species *Phakopsora euvitis* (Ono 2000). The other two fungi retained the names *Phakopsora ampelopsidis* (on species of the genus *Ampelopsis*, Vitaceae) and *P. vitis* (on species of the genus *Parthenocissus*, Vitaceae). Further work by Chatasiri and Ono (2008) using molecular phylogenetic analyses on material collected from Australia, East Timor and Japan confirms the distinctiveness of the three species recognised by Ono (Ono 2000). The samples of *Phakopsora euvitis* collected from East Timor and Australia (where an incursion has been eradicated) are genetically distinct from the Japanese collections and may represent a separate species (Chatasiri and Ono 2008).

In Japan, the *Vitis* hosts of *Phakopsora euvitis* has been reported to include *Vitis amurensis*, *V. coignetiae*, *V. ficifolia*, *V. flexuosa, V. labrusca*, *V. vinifera* and *V. labrusca* × *V. vinifera* (Ono 2000; Farr and Rossman 2013b). According to Farr (Farr and Rossman 2013b), *Phakopsora ampelopsidis* has also been reported in Japan on *V. coignetiae*, *V. ficifolia*, *V. inconstans*, *V. thunbergii* and *V. vinifera.* Based on the work by Ono (2000), the records of *P. ampelopsidis* on *Vitis* species in Japan are assumed to be *P. euvitis*.

For the purpose of the pest risk assessment presented here it is assumed that all records of grape leaf rust in east Asia are *Phakopsora euvitis,* including the earlier literature on *Phakopsora ampelopsidis* and *Phakopsora vitis*, when reported on a grape (*Vitis* spp.) host.

Phakopsora euvitis is heteroecious and macrocyclic (Weinert *et al.* 2003). Basidiospores are formed from teliospores in overwintered *Vitis* spp. leaves and infect *Meliosma myriantha* (in Japan and China) or *M. cuneifolia* (in China) (family *Sabiaceae*), the alternate hosts (Ono 2000; Weinert *et al.* 2003). Pycnidia and aecia are formed on *M. myriantha* leaves following infection (Ono 2000). The alternate host *M. myriantha* is widely distributed in Japan (USDA 2009) but *Meliosma* spp. do not appear to be present in Australia (ANBG 2013). In tropical and subtropical climates, *Phakopsora euvitis* can persist as the uredinial stage on *Vitis* spp. (Weinert *et al.* 2003; Daly and Hennessy 2006).

A pathogen recorded as *Phakopsora euvitis* was detected in Darwin in 2001 (Weinert *et al.* 2003) and declared eradicated in 2007 (Liberato *et al.* 2007; EPPO 2007). During that outbreak, laboratory and field trials demonstrated infection by *P. euvitis* on *Ampelocissus acetosa* and *A. frutescens*, two native Vitaceae species. However, the distributions of *A. acetosa* and *A. frutescens* are restricted to parts of northern Australia where little or no commercial production of grapes occurs (Daly *et al.* 2005).

Spores of *P. euvitis* can easily be transported by wind (CABI-EPPO 2006). Mycelium may persist in grapevine shoots during winter and then urediniospores formed on these shoots become the primary infection source (EPPO 2002; Weinert *et al.* 2003). Uredospores require water for germination and germinate at temperatures of 8–32 °C, with an optimum of 24 °C. Teliospores germinate between 10 °C and 30 °C, with an optimum range between 15 °C and 25 °C. High humidity at night is necessary for development of epidemics (Leu 1988).

Phakopsora euvitis usually infects leaves (Ono 2000; Chalkley 2010), and occasionally petioles, young shoots and rachises (Leu 1988). The symptoms are yellowish to pale brownish spots or irregular shaped lesions, with masses of yellowish orange urediniospores on the abaxial surface of the lesion (Chalkley 2010). The telia are crust-like and orange-brown, becoming dark brown or almost blackish. Heavy infection is common and can cause early senescence and leaf drop (Chalkley 2010).

The risk scenario of concern for *P. euvitis* is that the fungus and/or urediniospores may be present on grape bunches imported into Australia.

Phakopsora euvitis was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b). The assessment of *Phakopsora euvitis* presented here builds on these existing policies.

The probability of importation for *Phakopsora euvitis* was rated as 'moderate' in the assessments for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *Phakopsora euvitis* was rated as 'moderate' in the assessments for table grapes from China (Biosecurity Australia 2011a) and from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of *Phakopsora euvitis* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *Phakopsora euvitis* will be imported into Australia with table grapes from Japan.

4.19.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Phakopsora euvitis* will arrive in Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Phakopsora euvitis* is widely distributed in Japan. It has been reported present on Hokkaido, Honshu, Kyushu, Ryukyu Archipelago and Shikoku (CABI-EPPO 2007b). The prefectures *Phakopsora euvitis* has been reported present in include Fukushima, Gumma, Hiroshima, Hyogo, Ibaraki, Nagano, Niigata, Okinawa, Saitama, Tochigi, Tokyo, Tottori, Yamagata and Yamanashi (Ono 2000).

- In Japan, *Phakopsora euvitis* has been recorded on the table grape cultivars 'Campbell Early', 'Delaware' and 'Kyoho' (Ono 2000), which are widely cultivated and derived from *V. labrusca* and *V. vinifera* (Morinaga 2001). Japan intends to export 'Kyoho' to Australia, but not 'Campbell Early' or 'Delaware'.
- The pathogen occasionally infects rachises (Leu 1988) and hence may be present in harvested bunches. The USDA considered *P. euvitis* on the fresh fruit pathway for table grapes from Korea (USDA-APHIS 2002).
- Harvested grapes might also be contaminated by urediniospores.
- The ability to overwinter in temperate regions (Ono 2000; Weinert *et al.* 2003; Chatasiri and Ono 2008) indicates that this fungus could survive storage and transport at low temperatures. Urediniospores of *P. euvitis* have been shown to survive temperatures as low as 5 ºC (Daly and Hennessy 2007).

The wide distribution of this fungus in Japan and the likelihood that urediniospores of this fungus will survive storage, moderated by the fact that the fungus only occasionally infects rachises, support a likelihood estimate for importation of 'moderate'.

Probability of distribution

As indicated above, the probability of distribution for *Phakopsora euvitis* assessed here would be the same as that for *Phakopsora euvitis* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is '**Moderate**'.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Phakopsora euvitis* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.19.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *Phakopsora euvitis* assessed here would be the same as that for *Phakopsora euvitis* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **Moderate**

Probability of spread: **High**

4.19.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Phakopsora euvitis* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.19.4 Consequences

The consequences of the establishment of *Phakopsora euvitis* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**D**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for *Phakopsora euvitis* are estimated to be: **Moderate**.

4.19.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Phakopsora euvitis*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Moderate**
Unrestricted risk	**Low**

As indicated, the unrestricted risk estimate for *Phakopsora euvitis* has been assessed as 'low' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.20 Phomopsis cane and leaf spot

Phomopsis viticola[EP, WA]

Phomopsis cane and leaf spot, caused by the fungus *Phomopsis viticola*, is an important disease in several viticultural regions of the world (Nair *et al.* 1994), especially where rain following bud break keeps grapevines wet for several days (Hewitt and Pearson 1988). *Phomopsis viticola* is established in New South Wales, Queensland, South Australia, Tasmania and Victoria (Mostert *et al.* 2001; Plant Health Australia 2001a). *Phomopsis viticola* is not known to be present in Western Australia and is a pest of quarantine concern for that state.

Phomopsis viticola infects leaves, young shoots, rachises, petioles and fruit (Hewitt and Pearson 1988). After infection of juvenile fruit, symptoms do not appear until the fruit matures. On the fruit, the early symptoms are browning and shrivelling (Ellis and Erincik 2005). On rachises, the symptoms are chlorotic spots with dark centres (Hewitt and Pearson 1988). These spots enlarge to form dark brown streaks and blotches that turn black (Hewitt and Pearson 1988). Rachises may become brittle from numerous infections and break, resulting in loss of fruit (Hewitt and Pearson 1988). Pycnidia (fruiting structures) are subepidermal. Yellowish spore masses are exuded and then the berries shrivel and mummify (Gubler and Leavitt 1992). *Phomopsis viticola* conidia are splash dispersed and usually spread only short distances, that is within a vine or adjacent vines. Long distance spread is usually by movement of infected or contaminated propagation material (Hewitt and Pearson 1988).

The fungus overwinters in infected canes and rachises on the vine (Ellis and Erincik 2005). Production of conidia requires at least 10 hours of wetness with relatively low temperatures (Rawnsley and Wicks 2002). A further 8–10 hours of very high relative humidity or surface wetness is required for infection to occur (Emmett *et al.* 1992).

The risk scenario of concern for *P. viticola* is the presence of the fungus on mature bunches of imported grapes.

Phomopsis viticola was included in the existing import policies for table grapes from Chile (Biosecurity Australia 2005), table grapes from China (Biosecurity Australia 2011a), table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). The assessment of *Phomopsis viticola* presented here builds on these existing policies.

The probability of importation for *Phomopsis viticola* was rated as ‘low’ in the assessments for table grapes from Chile (Biosecurity Australia 2005) and table grapes from California to Western Australia (DAFF 2013), and as ‘high’ in the assessments for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *Phomopsis viticola* was rated as ‘very low’ in the assessment for table grapes from Chile. This rating was based on the information that the expected import window occurs during the period when Australian grapevines were considered less susceptible to infection by this pathogen. Because the import season for table grapes from China and Korea is significantly different from that for table grapes from Chile, the probability of distribution for *P. viticola* was reassessed and was rated as ‘low’ for table grapes from China (Biosecurity Australia 2011a) and was adopted for table grapes from Korea (Biosecurity Australia 2011b). The import season for table grapes from California overlaps those for table grapes from Chile, China and Korea and taking into consideration new information, the probability of distribution for *P. viticola* was reassessed, and was rated as 'very low', for table grapes from California to Western Australia (DAFF 2013). The expected import window for table grapes from Japan is similar to that for table grapes from California. The probability of distribution after arrival in Western Australia of *Phomopsis viticola* for table grapes from Japan will not differ from that for table grapes from California.

The probability of establishment and of spread in Western Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Western Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *Phomopsis viticola* will be imported into Western Australia with table grapes from Japan.

4.20.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Phomopsis viticola* will arrive in Western Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Phomopsis viticola* is a recognised pathogen of grapevine in Japan (Kobayashi 2007; MAFF 2008a; NIAS 2012). It has been reported present in Hokkaido, Honshu (Yamanashi, Nagano, Tottori and Okayama), Shikoku and Kyushu (Oita) (Kobayashi 2007).
- The teleomorph of this fungus, *Cryptosporella viticola*, is not known to be present in Japan (Kobayashi 2007).
- Application of fungicides and removal of dead and diseased parts from vines and orchards are used to control the disease in Japan (MAFF 2008a).
- *Phomopsis viticola* forms splash-dispersed conidia that infect leaves, young shoots, rachises, petioles and fruit (Hewitt and Pearson 1988). *Phomopsis viticola* affects the fruit of grapevine in Japan (MAFF 2008a).
- At least 10 hours of rain in combination with low temperatures are necessary for spore production and an additional 8–10 hours of moist conditions are required for infection to occur (Rawnsley and Wicks 2002). Anco *et al.* (2013) found 21 °C to be the optimum temperature for sporulation. Prolonged periods of rain and cold weather are favourable for the development of disease epidemics (Hewitt and Pearson 1988). Such climatic conditions may occur in some grape growing areas in Japan.
- Berries can become infected directly or through infected rachis tissue (Erincik *et al.* 2002). Berry infection is favoured by 20–30 hour wet periods during flowering

(Rawnsley and Wicks 2002). High levels of moisture during flowering are likely to occur in some grape growing areas of Japan.

- Results from artificial inoculations trying to determine whether ripe berries are susceptible to infection with *P. viticola* are conflicting (Erincik *et al.* 2002). In a study where berries were artificially inoculated with *P. viticola* at various stages from bloom through veraison, berry infection occurred throughout these growing stages (Erincik *et al.* 2001). Another study where grape clusters were inoculated artificially showed that clusters inoculated at bloom had the most fruit rot at harvest, whereas clusters that were inoculated at veraison or during ripening did not show more fruit rot than noninoculated clusters (Pscheidt and Pearson 1989). Ripe berries of *Vitis labrusca* 'Niagara' and 'Malaga' showed rot symptoms 18 days after inoculation (Gregory 1913). In another study slight fruit injury was required for ripe berries to become infected and show symptoms (Lal and Arya 1982).
- Most berry infections seem to occur early in the season (Pscheidt and Pearson 1989; Ellis and Erincik 2005; Anco *et al.* 2011). Once present inside green tissues of the berry, the fungus becomes latent (Erincik *et al.* 2002) and infected berries remain without symptoms until close to harvest when the fruit is mature (Pscheidt and Pearson 1989; Ellis and Erincik 2005).
- Visual symptoms first appear close to harvest when infected berries turn brown and shrivel (Ellis and Erincik 2005), and black pycnidia are produced through the skin (Gubler and Leavitt 1992). These pycnidia exude yellowish spore masses before the berries finally shrivel and become mummified (Gubler and Leavitt 1992). Infected berries may abscise from the pedicel, leaving a dry scar (Hewitt and Pearson 1988). Infected bunches that show symptoms are likely to be culled during harvesting or packing processes.
- The rachis has been shown to be susceptible to infection, when inoculated artificially, from 12.7 centimetres shoot growth through to veraison (Pscheidt and Pearson 1989; Erincik *et al.* 2001). However, most infections occur early in the growing season and usually develop symptoms within three to four weeks after inoculation (Erincik *et al.* 2001; Anco *et al.* 2011). Lesions that develop on the rachises can result in premature withering of the cluster stem and infected clusters that survive until harvest will often produce infected or poor quality fruit (Anco *et al.* 2011). Due to brittle lesions on the rachises, the entire cluster or parts of the cluster may fall from the vine before harvest (Hewitt and Pearson 1988; Erincik *et al.* 2001). The likely rapid and obvious symptom development on rachises would allow for affected bunches to be removed during quality assurance procedures.
- When inoculated artificially, berries and rachises are susceptible to infection up to veraison (Erincik *et al.* 2001). However, most natural infections seem to occur early in the growing season (Pscheidt and Pearson 1989; Erincik *et al.* 2001; Anco *et al.* 2011).
- If or at what level late-season infection of grape bunches occurs under natural conditions is unknown. If some grape bunches are infected close to harvest, they may not display symptoms at harvest or during packing processes and may be packaged for export.
- If the disease is not controlled early in the growing season and environmental conditions are favourable, berry infection can lead to serious losses (Ellis and Erincik 2005; Anco *et al.* 2011).

- *Phomopsis viticola* survives winter in grape cane tissues that were infected in previous years (Hewitt and Pearson 1988; Mostert *et al.* 2000; Nita 2005). Although it is unknown how well the fungus could overwinter on rachises or berries, it is likely that cold storage and transportation conditions would not significantly impact on the survival of *P. viticola* associated with infected grape clusters.
- In a study to investigate micromycetes in imported fruits and vegetables into Lithuania during the period of 2003–2004 where imported produce were sampled from two wholesale centres, *P. viticola* was found, among other pathogens, on table grapes imported from South Africa (Raudoniene and Lugauskas 2005).

The presence of this fungus in major grape growing areas in Japan, the climate in Japan which is conducive to the development of the disease, the uncertainty about symptom development in bunches infected close to harvest, moderated by the fact that most infections occur early in the growing season and symptoms usually show before harvest and affected bunches would be culled, support a likelihood estimate for importation of 'moderate'.

Probability of distribution

As indicated above, the probability of distribution for *Phomopsis viticola* assessed here would be the same as that for *Phomopsis viticola* for table grapes from California to Western Australia (DAFF 2013), that is **Very low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Phomopsis viticola* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.20.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *Phomopsis viticola* assessed here would be the same as that for *Phomopsis viticola* for table grapes from Chile (Biosecurity Australia 2005), which was adopted for table grapes from China (Biosecurity Australia 2011a), table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **High**

Probability of spread: **Moderate**

4.20.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Phomopsis viticola* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Very low**.

4.20.4 Consequences

The consequences of the establishment of *Phomopsis viticola* in Western Australia have been estimated previously for table grapes from Chile (Biosecurity Australia 2005) and were adopted for table grapes from China (Biosecurity Australia 2011a), table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**B**
International trade	**B**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for *Phomopsis viticola* are estimated to be: **Low**.

4.20.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Phomopsis viticola*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Phomopsis viticola* has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.21 Grape cluster black rot

*Physalospora baccae*EP

Grape cluster black rot, or axle blotch as it is also called in China, is a fungal disease of grapes in Japan caused by *Physalospora baccae* (MAFF 1989b). In Japan, the disease is also known as 'Fusagare' (cluster rot) or 'Zikugare' (peduncle rot) (Nishikado 1921). There has been some debate about the nomenclature of the causal organism.

The name *Physalospora baccae* Cavara, which was used to describe a new pathogen in Italy in 1888, is a *nomen dubium* of unknown application. It is not known if the grape pathogen to which this name is applied in Japan and Korea is the same as the original European pathogen. It was suggested that the grape pathogen in Japan/Korea should be designated as '*Physalospora baccae* sensu Asian authors' (Harman 2009). '*Physalospora baccae* sensu Nishikado non Cavara' is listed in the National Institute of Agrobiological Sciences Genebank Database of Plant Diseases in Japan (NIAS 2012). In China, *Physalospora baccae* Cavara has been considered to be a synonym of *Guignardia baccae* (Cav.) Jacz. (Tai 1979; Qi *et al.* 2007), which is not a valid name (Phillips 2000). *Guignardia baccae* (Cav.) Jacz. was included in the pest list provided by MAFF (1989) as a synonym of *Physalospora baccae* sensu Nishikado non Cavara.

Little information is formally published on *Physalospora baccae*. Asian publications on *Physalospora baccae* and its synonyms discussed above were used to develop this assessment.

Physalospora baccae infects grape berries, leaves, pedicels and peduncles. In China, wind, rain and insects spread the conidia and ascospores in May and June with the peak disease period being from July to September when the weather is warm and humid. Fruit is likely to develop disease symptoms from when they start to ripen up until harvest (Zhang 2005).

The risk scenario of concern for *Physalospora baccae* is that the fungus may be imported into Australia with infected grape bunches.

Physalospora baccae was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b). The assessment of *Physalospora baccae* presented here builds on these existing policies.

The probability of importation for *Physalospora baccae* was rated as 'high' in the assessments for table grapes from China (Biosecurity Australia 2011a) and table grapes from Korea (Biosecurity Australia 2011b).

The probability of distribution for *Physalospora baccae* was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a) and from Korea (Biosecurity Australia 2011b). The probability of distribution after arrival in Australia of *Physalospora baccae* will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that *Physalospora baccae* will be imported into Australia with table grapes from Japan.

4.21.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Physalospora baccae* will arrive in Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- *Physalospora baccae* is a recognised pathogen of grapes in Japan (MAFF 1989b; MAFF 2008a; NIAS 2012).
- It is prevalent in the Okayama Prefecture and a few other places where *Vitis vinifera* is cultivated in Japan (Nishikado 1921). According to Kobayashi (2007), *P. baccae* has been reported present in the Japanese prefectures of Hiroshima, Hokkaido, Okayama, Osaka, Tochigi and Yamanashi.
- In China, *P. baccae* generally only causes serious damage in areas with poor horticultural practices in seasons that are warm and wet (Zhang 2005; BAIKE 2009; NYZSW 2009).
- Crop monitoring and fungicide applications are used to manage grape cluster black rot in Japan (MAFF 2008a).
- *Physalospora baccae* overwinters as pycnidia and perithecia on infected peduncles, pedicels and fruit as well as on fallen leaves and trash within the vineyards. It can also overwinter as mycelia in the infected tissues and produce perithecia the next spring (BAIKE 2009; NYZSW 2009).
- During periods of wet weather in spring when temperatures rise, overwintered pycnidia and perithecia of *P. baccae* release conidia and ascospores (BAIKE 2009; NYZSW 2009). In China, wind, rain and insects spread the conidia and ascospores to infect grape clusters in May and June. Symptoms start to appear in July, with the peak disease period from July to September when the weather is warm and humid. Fruit is likely to develop disease from when they start to ripen until harvest (Zhang 2005).
- The reported timing suggests a period of symptomless infection of two months or more, that is from May until July. No other information was found concerning symptomless infection, but it was considered that it might occur after July, close to or at harvest. In addition, fungicide applications may delay and modify or mask symptom expression. Chinese table grapes for export are generally harvested from August to October. This timeframe would be similar for export of table grapes from Japan.
- Infected pedicels develop light brown spots around the junction with the fruit. Pedicels dry and shrink when the brown spots encircle them and infections then spread to the fruit and peduncles (Zhang 2005; NYZSW 2009).
- After infection, peduncles develop brown spots that slowly turn black and enlarge and then the peduncles dry out (Zhang 2005; NYZSW 2009).

- Infected berries develop irregular brown spots that spread to cover the whole fruit. Infected berries then turn purple or black and dry out. Small black spots (pycnidia) develop on their surface. The infected mummified berries remain in the grape cluster on the vine and do not drop off (Zhang 2005; NYZSW 2009).
- The reported information suggests pycnidia may release conidia during summer and autumn, allowing spores to contaminate the surfaces of grape clusters.
- Inferior or defective grape berries are likely to be removed from bunches during harvesting and packing processes. This will not remove fruit with symptomless infection and it is possible that a small proportion of mummified berries in infected bunches may escape detection.
- Pycnidia, perithecia and mycelia of the pathogen survive through winter in dead plant matter (Zhang 2005; NYZSW 2009). Fruiting structures, spores and mycelia of the pathogen are likely to survive cold storage and transport.

The presence of this fungus in major grape growing areas in Japan, the potential for infected grape clusters to be symptomless and the likelihood that the pathogen will survive storage and transport, support a likelihood estimate for importation of 'high'.

Probability of distribution

As indicated above, the probability of distribution for *Physalospora baccae* assessed here would be the same as that for *Physalospora baccae* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b), that is '**Moderate**'.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Physalospora baccae* will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Moderate**.

4.21.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for *Physalospora baccae* assessed here would be the same as that for *Physalospora baccae* for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **High**

Probability of spread: **High**

4.21.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Physalospora baccae* will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Moderate**.

4.21.4 Consequences

The consequences of the establishment of *Physalospora baccae* in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**A**
Eradication, control	**E**
Domestic trade	**E**
International trade	**D**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for *Physalospora baccae* are estimated to be: **Moderate**.

4.21.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Physalospora baccae*	
Overall probability of entry, establishment and spread	**Moderate**
Consequences	**Moderate**
Unrestricted risk	**Moderate**

As indicated, the unrestricted risk estimate for *Physalospora baccae* has been assessed as 'moderate' which exceeds Australia's ALOP. Therefore, specific risk management measures are required for this pest.

4.22 White rot

Pilidiella castaneicola[WA] *and Pilidiella diplodiella*[WA]

Pilidiella castaneicola and *Pilidiella diplodiella* are plant pathogenic fungi that cause white rot, also known as hail disease, of grapevine (Bisiach 1988; Yamato 1995; Kishi 1998).

Pilidiella castaneicola and *Pilidiella diplodiella* are assessed together as the two species cause the same disease and their biology is likely to be very similar, and they are predicted to pose a similar risk and to require similar mitigation measures. Unless explicitly stated, the information presented is considered as applicable to both species. In this section, the common name white rot is used to refer to both species. The scientific name is used when the information is about a specific species.

Pilidiella castaneicola and *Pilidiella diplodiella* are not known to be present in Western Australia and are pests of quarantine concern for that state. *Pilidiella castaneicola* is known to be present on a number of hosts, but not on grapevine, in NSW, NT, Qld and Vic. (Plant Health Australia 2001b; Langrell *et al.* 2008). *Pilidiella diplodiella* is known to be present on grapevine in NSW and Qld (Simmonds 1966; Plant Health Australia 2001b). White rot of grapevine caused by *P. diplodiella* is rare in Australia and of little economic significance (Sergeeva 2010).

Both *P. castaneicola* and *P. diplodiella* have been reported on grapevine in Japan (MAFF 1989b; Yamato 1995; Kobayashi 2007; NIAS 2013).

Pilidiella castaneicola and *Pilidiella diplodiella* affect peduncle, rachis, pedicel and berries of grapevine (Bisiach 1988; Yamato 1995; Kishi 1998). *Pilidiella diplodiella* is known to infect both young and mature grape berries (Lauber and Schuepp 1968). The assessed fungi are unable to infect intact grape berries directly (Bisiach 1988; Kishi 1998). Infection of intact berries occurs through the pedicel and progresses through the subepidermal layers of the berry (Locci and Quaroni 1972; Bisiach and Viterbo 1973). Peduncle, rachis and pedicel can be directly infected by the pathogens without wounding and symptoms progress down towards the berries (Locci and Quaroni 1972; Bisiach and Viterbo 1973; Kishi 1998). If conditions are favourable, the disease can also spread from an infected, injured berry through the pedicel to the rachis and lead to the decay of a major portion of the grape cluster (Lauber and Schuepp 1968; Bisiach and Viterbo 1973).

Pilidiella diplodiella is also known to cause cankers in nonlignified shoots of grapevine but it rarely infects leaves (Bisiach 1988).

Typical white rot symptoms are found on grape clusters before veraison (the beginning of fruit ripening) a few days after a hailstorm. The infected berries turn yellow and later blue, lose their turgor and become covered with brown to violet pycnidia, which, when mature, turn white/grey (Lauber and Schuepp 1968; Bisiach 1988). The berries dry out and fall to the ground at the end of the season (Lauber and Schuepp 1968; Bisiach 1988) and contaminate the soil (Bisiach 1988). Dried pycnidia of *P. diplodiella* remain able to produce viable conidia for more than 15 years and released conidia remain viable for two to three years (Bisiach 1988). Symptoms on peduncle, rachis and pedicel begin as small, pale brown, elongated depressions, which may spread in favourable conditions (Bisiach 1988). If a lesion occurs on the rachis, the proportion of the cluster below the lesion dries quickly (Bisiach 1988).

White rot of grapevine caused by *Pilidiella diplodiella* is common in areas that are prone to hailstorms (Bisiach 1988). In the absence of hailstorms, summer rain followed by persistent high humidity combined with temperatures of 24–27 °C can also lead to disease outbreaks (Bisiach 1988). Fruit clusters become contaminated with the pathogen when soil containing conidia is splashed onto the clusters by rain and hailstones or farm machinery (Bisiach 1988). Hail damage is the principle predisposing factor for infection with this pathogen. Heavy rain, mechanical injury, sun scorch and wounding caused by downy mildew (*Plasmopara viticola*) and insects can also facilitate infection to a lesser extent (Sutton and Waterston 1964; Bisiach 1988).

Disease development of *P. diplodiella* occurs rapidly at temperatures of 24–27 °C, slowly at temperatures below 15 °C and only slightly above 34 °C (Locci and Quaroni 1972; Bisiach 1988). Infection is negligible if the temperatures are below 15 °C for 24–48 hours following a hailstorm (Bisiach 1988). Incubation periods of the assessed fungi can vary, from three to eight days, with temperature, relative humidity, means of penetration and the tissue infected (Bisiach and Viterbo 1973; Bisiach 1988; Kishi 1998).

Bisiach and Viterbo (1973) performed inoculation trials in the field on undamaged grape clusters where spore suspensions of *Pilidiella diplodiella* were sprayed onto clusters that were then placed in plastic bags to retain humidity. In one trial, clusters were inoculated at flower stage and at the stage of completed fruit set (berries between 2–3 millimetres in diameter). For clusters inoculated at flower stage, primary symptoms have been immediately followed by a sudden browning of the flower cluster (Bisiach and Viterbo 1973). Drying off progressed more slowly on the clusters inoculated at the stage of completed fruit set, as compared to those inoculated at flowering, and was completed ten days after inoculation (Bisiach and Viterbo 1973). In another trial, clusters of two varieties, ‘Riesling’ and ‘Tocai’, were inoculated at the stage of completed fruit set. Symptoms are seen after three and five days on ‘Riesling’ and ‘Tocai’, respectively (Bisiach and Viterbo 1973). After six days, the clusters of both varieties were completely browned and dried, and pycnidia developed in high numbers on fruit and rachis (Bisiach and Viterbo 1973). In laboratory studies, infection with *P. diplodiella* was also stimulated by high relative humidity (90–100 per cent) (David and Rafaila 1966).

Pilidiella castaneicola has a variety of hosts (Nag Raj 1993; Van Niekerk *et al.* 2004; Farr and Rossman 2012). In addition to *Vitis* spp., *P. castaneicola* is also known to cause fruit rot of strawberries and is found on foliage of broadleafed trees (Farr and Rossman 2012). This fungus is commonly found on leaves of *Eucalyptus*, but is of minor importance as a leaf pathogen (Van Niekerk *et al.* 2004).

Pilidiella diplodiella has been reported on *Vitis* spp. in numerous countries including India, China, Italy and South Africa (Farr and Rossman 2013a). While *Vitis* spp. are the principle hosts of *P. diplodiella,* this species has also been reported causing necrotic lesions on leaf blades of *Hibiscus sabdariffa* (roselle) in Mexico and leaf spot of *Artabotrys hexapetalos* (ylang ylang vine) in India (Shreemali 1973; Sánchez *et al.* 2011).

The risk scenario of concern for *Pilidiella castaneicola* and *Pilidiella diplodiella* is that symptomless infected grape bunches may be imported into Western Australia.

4.22.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will arrive in Western Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- *Pilidiella castaneicola* and *P. diplodiella* have been reported on grapevine in Japan (MAFF 1989b; Yamato 1995; Kobayashi 2007; NIAS 2013). Both fungi are associated with white rot of grape berries in Japan (Yamato 1995).
- *Pilidiella castaneicola* has been reported present in Ishikawa, Tottori, Shiga, Shimane and Tokushima prefectures (Kaneko 1981; Kobayashi 2007). The distribution of *P. diplodiella* in Japan is not clear.
- White rot of grapevine caused by *Pilidiella diplodiella* is common in areas that are prone to hailstorms (Bisiach 1988). In the absence of hailstorms, summer rain followed by persistent high humidity combined with temperatures of 24–27 °C can also lead to disease outbreaks (Bisiach 1988). These climatic conditions are expected to be available in the export production regions in Japan (see Figure 3.2). However, no reports were found on the economic significance of *P. diplodiella* on grapevine in Japan. Sutton and Waterstone (1964) note that white rot caused by *P. diplodiella* is sporadic.
- Similarly, there are no reports on the economic significance of *P. castaneicola* on grapevine in Japan (MAFF 2013d). The disease caused by *P. castaneicola* on grapevine seems to occur sporadically or causes damage at the same sites every year (Rural Culture Association Japan 2005).
- A number of studies and reports indicate that infections and outbreaks of white rot caused by *P. diplodiella* often seem to occur before or at veraison. Bisiach (1988) notes that typical symptoms of white rot are found on grape clusters before veraison, a few days after a hailstorm. During a study conducted in Slovakia, *P. diplodiella* was isolated frequently from grape berries at early veraison and to a lesser extent at ripening before harvest (Mikusova *et al.* 2012). A study by David and Rafaila (1966) shows that attack by *P. diplodiella* increases with the increase in sugar content in the grape berries up to 3.0–3.5 per cent and that above 8 per cent sugar content no fructification occurs in the attacked area.
- Berries infected with *P. diplodiella* turn yellow and later blue, lose their turgor and become covered with brown to violet pycnidia, which, when mature, turn white/grey (Lauber and Schuepp 1968; Bisiach 1988). The berries dry out and fall to the ground at the end of the season (Lauber and Schuepp 1968; Bisiach 1988). Berries on infected immature clusters turn pale green, become limp and later turn brown (Bisiach 1988). Symptoms on peduncle, rachis and pedicel begin as small, pale brown, elongated depressions, which may spread in favourable conditions (Bisiach 1988). If a lesion occurs on the rachis, the proportion of the cluster below the lesion dries quickly (Bisiach 1988). Symptoms of *Pilidiella castaneicola* and *P. diplodiella* on grapevine differ only slightly (Yamato 1995).

- Grape clusters may become contaminated with conidia of *P. diplodiella* when contaminated soil is splashed onto the vine by heavy rain, hail or machinery (Bisiach 1988; Kishi 1998). Under favourable conditions, conidia will germinate on the grape cluster and initiate infection (Bisiach 1988).
- Incubation periods of the assessed fungi can vary, from three to eight days, with temperature, humidity, means of penetration and the tissue infected (Bisiach and Viterbo 1973; Bisiach 1988; Kishi 1998). Infection of grapevine by *P. diplodiella* is favoured by warm temperatures and high relative humidity (Bisiach 1988). Disease development of *P. diplodiella* occurs rapidly at temperatures of 24–27 °C, slowly at temperatures below 15 °C and only slightly above 34 °C (Locci and Quaroni 1972; Bisiach 1988). Infection is negligible if the temperatures are below 15 °C for 24–48 hours following a hailstorm (Bisiach 1988).
- Grape bunches with obvious symptoms of infection are likely to be removed during routine harvesting, grading and packing processes and would not be packed for export. Grape bunches without symptoms, or with only minor symptoms such as small lesions on peduncle, rachis or pedicel could still be exported.
- Grapes are usually stored and transported at low temperatures to prolong shelf life. Conidia of *P. diplodiella* germinate and initiate infection slowly at temperatures below 15 °C (Bisiach 1988). As a result, symptoms will develop more slowly under low temperatures. Some infected/contaminated grapes may exhibits no or mild symptoms at the time they arrive in Western Australia. Grape bunches without symptoms, or with only minor symptoms, may not be detected at routine inspection on arrival.

A possibility for some infected grape bunches showing no or mild symptoms, moderated by the sporadic and isolated occurrence of the disease, the lack of reports of the economic importance of the disease in Japan, the short time required for symptom development and the obvious symptoms of infection on berries, support a likelihood estimate for importation of ‘moderate’.

Probability of distribution

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will be distributed within Western Australia in a viable state as a result of the processing, sale or disposal of table grapes from Japan and subsequently transfer to a susceptible part of a host is: **Moderate**.

Supporting information for this assessment is provided below:

- Imported grapes are intended for human consumption. Based on Japan’s limited export capability, it is expected that volumes of table grapes from Japan to Australia per year will be very low, and those to Western Australia, if any, will be extremely low. As a result, the distribution of grape bunches by wholesale and retail trade is likely to be limited to the major cities of Western Australia. However, there is potential for individual consumers to distribute a small proportion of imported grape bunches to many localities within the state.
- As grapes are easily damaged during handling (Mencarelli *et al.* 2005), packed grapes may not be processed or handled again until they arrive at the retailers. Therefore, pathogens in packed grapes are unlikely to be detected during transportation and distribution to retailers.

- It could be expected that infected berries would show symptoms by the time they arrive at the retailers. Grape bunches with obvious symptoms of infection would not be marketable and would not be sold. However, if grapes are transported at low temperatures, symptoms may develop more slowly. Grape bunches without symptoms or with only minor symptoms could be marketable and could be sold.
- Most fruit waste will be discarded into managed waste systems and will be disposed of in municipal tips and would therefore pose little risk of exposure to a suitable host.
- Consumers will discard small quantities of fruit waste in urban, rural and natural localities. Small amounts of fruit waste will be discarded in domestic compost. There is some potential for consumer waste being discarded near host plants, including commercially grown, household or wild host plants. If present in fruit waste, the assessed fungi would then need to be transferred to a susceptible host.
- *Pilidiella castaneicola* has a variety of hosts including *Acer* sp., *Carya* sp., *Castanea* spp., *Eucalyptus* spp., *Fragaria* sp., *Liquidambar styracifolia* (sweet gum), *Metrosideros* sp., *Mangifera indica* (mango), *Quercus alba* (white oak), *Q. rubra* (red oak), *Quercus* sp., *Rhus copallina* (black sumac), *Rhus* sp., *Rosa rugosa-prostrata*, *Vitis cordifolia* and *V. vinifera* (Nag Raj 1993; Farr and Rossman 2012). Some of these hosts are widely distributed in Western Australia.
- *Vitis vinifera* is the principle host of *P. diplodiella* (Bisiach 1988; Van Niekerk *et al.* 2004). This fungus has also been reported to cause a disease on *Hibiscus sabdariffa* (roselle) and *Artabotrys hexapetalos* (ylang ylang vine) (Shreemali 1973; Sánchez *et al.* 2011). Single reports have been found for *P. diplodiella* on *Rosa* sp., *Geranium* sp. and *Anogeissus latifolia* (buttontree) in India and *Citrus aurantiifolia* (lime) in Mexico (Singh and Sinch 1966; Farr and Rossman 2013a). In Western Australia, *Vitis* spp. are grown commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013). Other possible hosts may also be available in Western Australia including *Hibiscus sabdariffa*, *Rosa* sp., *Geranium* sp. and *Citrus aurantiifolia*. *Hibiscus sabdariffa* is regarded an environmental weed and has widely naturalised in northern Western Australia (University of Queensland 2011).
- Pycnidia and conidia of *Pilidiella diplodiella* overwinter on dead plant material and in the soil in vineyards (Bisiach 1988). Dried pycnidia of *P. diplodiella* remain able to produce viable conidia for more than 15 years and released conidia remain viable for two to three years (Bisiach 1988). Pycnidia and conidia of the assessed fungi are likely to survive storage and transport.
- Conidia of the assessed fungi are dispersed over short distances by water splash from infected plant material or contaminated soil (Sutton and Waterston 1964; Bisiach 1988; Kishi 1998). In wet conditions, conidia present on the surface of infected grape bunches or fruit waste could be transmitted via rain splash and wind-driven rain to susceptible nearby host plants.
- Infection of grapevine by *P. diplodiella* is favoured by warm temperatures and high relative humidity (Bisiach 1988). Germination of conidia and development of infection progress rapidly at 24–27 °C, slowly below 15 °C and only slightly above 34 °C (Locci and Quaroni 1972; Bisiach 1988). Infection is negligible if the temperatures are below 15 °C for 24–48 hours following a hailstorm (Bisiach 1988). In laboratory studies, infection with *P. diplodiella* was stimulated by high relative humidity (90–100 per cent) (David and Rafaila 1966).

- Generally Japanese fresh grapes are exported from June to December, with the peak volumes occurring in August–October (ITC Comtrade 2012) (late winter to mid spring in Australia). The assessed fungi can infect rachis, pedicel and berries of grapevine (Bisiach 1988; Yamato 1995; Kishi 1998). The fungus rarely infects grapevine leaves, but on some cultivars, it can also infect non-lignified shoots (Bisiach 1988). Grapevines in Western Australia would be susceptible to infection during parts of the expected export window. Other hosts of the assessed fungi may also be susceptible to infection during the expected export window.

The wide distribution of a number of hosts in Western Australia, the host susceptibility during the expected export window and the ability for pycnidia and conidia of at least one of the assessed fungi, *Pilidiella diplodiella*, to remain viable for a long period of time on dead plant material and in the soil, moderated by the limited range of potential conidia dispersal via rain splash from fruit waste to a susceptible part of a host and the fact that very low volumes, if any, of imported grape bunches will be distributed within Western Australia, support a likelihood estimate for distribution of ‘moderate’.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.22.2 Probability of establishment

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will establish within Western Australia, based on a comparison of factors in the source and destination areas that affect pest survival and reproduction, is: **Moderate**.

Supporting information for this assessment is provided below:

- *Pilidiella castaneicola* has a variety of hosts including Acer sp., *Carya* sp., *Castanea* spp., *Eucalyptus* spp., *Fragaria* sp., *Liquidambar styracifolia* (sweet gum), *Metrosideros* sp., *Mangifera indica* (mango), *Quercus alba* (white oak), *Q. rubra* (red oak), *Quercus* sp., *Rhus copallina* (black sumac), *Rhus* sp., *Rosa rugosa-prostrata*, *Vitis cordifolia* and *V. vinifera* (Nag Raj 1993; Farr and Rossman 2012). Some of these hosts are widely distributed in Western Australia.
- *Vitis vinifera* is the principle host of *P. diplodiella* (Bisiach 1988; Van Niekerk *et al.* 2004). This fungus has also been reported to cause a disease on *Hibiscus sabdariffa* (Roselle) and *Artabotrys hexapetalos* (ylang ylang vine) (Shreemali 1973; Sánchez *et al.* 2011). Single reports have been found for *P. diplodiella* on *Rosa* sp., *Geranium* sp. and *Anogeissus latifolia* (buttontree) in India and *Citrus aurantiifolia* (lime) in Mexico (Singh and Sinch 1966; Farr and Rossman 2013a). In Western Australia, *Vitis* spp. are grown commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013). Other possible hosts may also be available to aid establishment in Western Australia including *Hibiscus sabdariffa*, *Rosa* sp., *Geranium* sp. and *Citrus aurantiifolia*. *Hibiscus sabdariffa* is regarded an environmental

weed and has widely naturalised in northern Western Australia (University of Queensland 2011).

- Disease outbreaks of white rot on grapevine caused by *P. diplodiella* are favoured by hailstorms or summer rain followed by persistent high humidity combined with temperatures of 24–27 °C (Bisiach 1988). Hail damage is the principle predisposing factor for infection with this pathogen. Heavy rain, mechanical injury and wounding caused by downy mildew (*Plasmopara viticola*) and insects can also facilitate infection to a lesser extent (Sutton and Waterston 1964; Bisiach 1988). These conditions may exist in some areas of Western Australia to facilitate the establishment of the assessed fungi.
- While the assessed fungi are present in eastern states of Australia, white rot of grapevine caused by *P. diplodiella* is rare in eastern states and of little economic significance (Sergeeva 2010). No reports on economic damage caused by *P. castaneicola* in eastern states of Australia were found.
- Dried pycnidia of *P. diplodiella* remain able to produce viable conidia for more than 15 years. The released conidia remain viable for two to three years (Bisiach 1988). The assessed fungi may persist in the environment as conidia or pycnidia. Inoculum may germinate once conditions are favourable and establish an infection on a suitable host.

The durability of pycnidia and conidia of at least one of the assessed fungi, *Pilidiella diplodiella*, and the wide distribution of hosts, moderated by the specific circumstances required for infection or disease outbreaks to occur, support a likelihood estimate for establishment of 'moderate'.

4.22.3 Probability of spread

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will spread within Western Australia, based on a comparison of factors in source and destination areas that affect the expansion of the geographic distribution of the pest, is: **Moderate**.

Supporting information for this assessment is provided below:

- Conidia of the assessed fungi are dispersed over short distances by water splash from infected plant material or contaminated soil (Sutton and Waterston 1964; Bisiach 1988; Kishi 1998). However, infected host fruits may be distributed throughout Western Australia for human consumption. The movement of infected/contaminated propagation material or nursery stock and contaminated soil or compost may also contribute to spreading the assessed fungi to new areas.
- *Pilidiella castaneicola* has a variety of hosts including *Acer* sp., Carya sp., *Castanea* spp., *Eucalyptus* spp., *Fragaria* sp., *Liquidambar styracifolia* (sweet gum), *Metrosideros* sp., *Mangifera indica* (mango), *Quercus alba* (white oak), *Q. rubra* (red oak), *Quercus* sp., *Rhus copallina* (black sumac), *Rhus* sp., *Rosa rugosa-prostrata*, *Vitis cordifolia* and *V. vinifera* (Nag Raj 1993; Farr and Rossman 2012). Some of these hosts are widely distributed in Western Australia.
- *Vitis vinifera* is the principle host of *P. diplodiella* (Bisiach 1988; Van Niekerk *et al.* 2004). This fungus has also been reported to cause a disease on *Hibiscus sabdariffa* (Roselle) and *Artabotrys hexapetalos* (ylang ylang vine) (Shreemali 1973; Sánchez *et al.* 2011). Single reports have been found for *P. diplodiella* on *Rosa* sp., *Geranium* sp. and *Anogeissus latifolia* (buttontree) in India and *Citrus aurantiifolia* (lime) in Mexico (Singh and Sinch 1966; Farr and Rossman 2013a). In Western Australia, *Vitis* spp. are grown

commercially and are also common garden plants (Kiri-ganai Research Pty Ltd 2006; ABS 2009a; Waldecks 2013; ATGA 2013). Other possible hosts may also be available to aid spread in Western Australia including *Hibiscus sabdariffa*, *Rosa* sp., *Geranium* sp. and *Citrus aurantiifolia*. *Hibiscus sabdariffa* is regarded an environmental weed and has widely naturalised in northern Western Australia (University of Queensland 2011).

- Disease outbreaks of white rot on grapevine caused by *P. diplodiella* are favoured by hailstorms or summer rain followed by persistent high humidity combined with temperatures of 24–27 °C (Bisiach 1988). These conditions may exist in some areas of Western Australia to facilitate the spread of the assessed fungi.
- Dried pycnidia of *P. diplodiella* remain able to produce viable conidia for more than 15 years. The released conidia remain viable for two to three years (Bisiach 1988). The assessed fungi may persist in the environment in the new areas as conidia or pycnidia and could germinate and cause infection when susceptible hosts are available, and favourable conditions occur.

The potential movement of the assessed fungi to new areas via movement of infected host fruit, propagative materials and soil, the availability of hosts in various parts of Western Australia and the durability of conidia and pycnidia of at least one of the assessed fungi, *Pilidiella diplodiella*, moderated by the specific circumstances required for infection or disease outbreaks to occur, support a likelihood estimate for spread of ‘moderate’.

4.22.4 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that *Pilidiella castaneicola* and/or *Pilidiella diplodiella* will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Low**.

4.22.5 Consequences

The consequences of the establishment of *Pilidiella castaneicola* and/or *Pilidiella diplodiella* in Australia have been estimated according to the methods described in Table 2.3.

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are ‘**D**‘, the overall consequences for *Pilidiella castaneicola* and *Pilidiella diplodiella* are estimated to be: **Low**.

Reasoning for these ratings is provided below:

Criterion	Estimate and rationale
Direct	
Plant life or health	**Impact score**: D—Significant at the district level. *Pilidiella castaneicola* and *Pilidiella diplodiella* cause white rot of grapevine berries, leading to crop losses and reduced marketability (Bisiach 1988; Yamato 1995; Kishi 1998; Van Niekerk *et al.* 2004). White rot is of economic concern in areas prone to hailstorms and areas with high summer rainfall followed by high relative humidity and moderate temperatures (Bisiach 1988). In severe infections, mainly in regions prone to hailstorms, white rot can lead to crop losses of 20–80 per cent (Sutton and Waterston 1964; Bisiach 1988). *Pilidiella diplodiella* is one of the principal fungal diseases in China causing an annual loss of grape production of about 16.3 per cent (Li 2001; Li *et al.* 2008). This has been credited to seasonal heavy rainfall during the ripening of the fruit (Li *et al.* 2008). *Pilidiella castaneicola* is also known to cause leaf and fruit diseases of strawberry, and is found on foliage of broadleafed trees (Rossman *et al.* 2007; Farr and Rossman 2012). It is commonly found on leaves of *Eucalyptus*, but is of minor importance as a leaf pathogen (Van Niekerk *et al.* 2004). *Pilidiella castaneicola* is associated with leaf spot of eucalypts in plantations and nurseries (Viljoen *et al.* 1992; Brown and Ferreira 2000; Park *et al.* 2000). Most species of *Coniella* are found on eucalypts growing under very humid conditions (Park *et al.* 2000). No information was found on the economic significance of strawberry disease caused by *P. castaneicola.* This pathogen has been found in association with strawberry fruit rot on several occasions since 1918 in the US, but it is not commonly found (Maas 1984). *Pilidiella castaneicola* was also found on dead strawberry leaves (Maas 1984). In Western Australia the primary commercial crop that is a host of *P. diplodiella* is *Vitis vinifera*. In 2011, there were just under 13 000 hectares of grapes grown in Western Australia (ABS 2012). Disease outbreaks of white rot on grapevine caused by *P. diplodiella* are favoured by hailstorms or summer rain followed by persistent high humidity combined with temperatures of 24–27 °C (Bisiach 1988). Thus, its potential to affect grape production in Western Australia is expected to be limited to areas/circumstances with similar environmental conditions. White rot of grapevine caused by *P. diplodiella* is rare in eastern states of Australia and of little economic significance (Sergeeva 2010).
Other aspects of the environment	**Impact score**: A—Indiscernible at the local level. There are no known direct consequences of the assessed fungi on other aspects of the natural environment.
Indirect	
Eradication, control etc.	**Impact score**: C—Minor significance at the district level. Measures to control white rot include prevention of wounding (such as those caused by powdery mildew or insects) and application of fungicides, especially immediately after a hailstorm (Lauber and Schuepp 1968; Bisiach 1988; OEPP-EPPO 2002). Measures used in Japanese vineyards to control *P. castaneicola* include applying fungicides, removing infected branches and carefully burying infected grape clusters (Rural Culture Association Japan 2005; MAFF 2013d). These measures are likely to be effective as there are no reports on the economic significance of *P. castaneicola* on grapevine in Japan (MAFF 2013d). Similar measures are expected to be used for the control of *P. diplodiella*. Applications of additional fungicides and other control measures may be required to control the assessed fungi, which would have costs associated with it.
Domestic trade	**Impact score**: A—Indiscernible at the local level. There would be no trade restrictions applied by other states as the fungi are present and there are no existing planting material controls for this pathogen. *Pilidiella castaneicola* and *Pilidiella diplodiella* are already known to be present in Australian eastern states—NSW, NT, Qld and Vic. for *P. castaneicola,* and NSW and Qld for *P. diplodiella* (Plant Health Australia 2001b). Their establishment in Western Australia would not have a negative impact on domestic trade.

Criterion	Estimate and rationale
International trade	**Impact score**: D—Significant at the district level. Both *P. castaneicola* and *P. diplodiella* are widely distributed (Bisiach 1988; Park *et al.* 2000; Wang and Lin 2004). *Pilidiella castaneicola* has been reported present in Brazil, Canada, China, Cuba, India, Indonesia, Japan, Korea, Nigeria, Pakistan, South Africa, Switzerland, Taiwan, the US and the West Indies (Nag Raj 1993; Wang and Lin 2004; Langrell *et al.* 2008; Farr and Rossman 2012). *Pilidiella diplodiella* has been reported present in Algeria, Austria, Brazil, Bulgaria, Canada, China, France, Germany, Great Britain, Greece, Hungary, India, Italy, Japan, Mexico, Nigeria, Rumania, the former Soviet Union, South Africa, Switzerland, Tanzania, Turkey, Uruguay, the US, Yugoslavia (Sutton and Waterston 1964; Simmonds 1966; Plant Health Australia 2001b; Van Niekerk *et al.* 2004; Farr and Rossman 2012). The presence of *P. castaneicola* and/or *P. diplodiella* in Western Australian commercial production areas of grapes, and in the case of *P. castaneicola* of mangoes, strawberries and other hosts, may limit access to overseas markets that are free from these pests. *Pilidiella castaneicola* is a quarantine pest for New Zealand (MAF Biosecurity New Zealand 2009a). *Pilidiella diplodiella* is a quarantine pest for New Zealand (MAF Biosecurity New Zealand 2009b; MAF Biosecurity New Zealand 2010) and Israel (PPIS Israel 2006).
Environmental and non-commercial	**Impact score**: B—Minor significance at the local level. Additional fungicide applications or other control measures would be required to control this disease on susceptible hosts and these may have minor impact on the environment.

4.22.6 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Pilidiella castaneicola* and *Pilidiella diplodiella*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Low**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for *Pilidiella castaneicola* and *Pilidiella diplodiella* has been assessed as ‘very low’ which achieves Australia’s ALOP. Therefore, no specific risk management measures are required for these pests.

4.23 Citrus exocortis viroid

Citrus exocortis viroid[EP, WA]

Citrus exocortis viroid (CEVd) is not known to occur in Western Australia (DAWA 2006a) and is a pest of quarantine concern for that state. In Australia, CEVd is known to be present in New South Wales, Queensland and South Australia (Barkley and Büchen-Osmond 1988) and has been detected in grapevine in South Australia (Wan Chow Wah and Symons 1997).

The viroid has been reported on citrus in Japan (Sano 2003b), but no reports were found for grapevine in Japan. On grapevine, CEVd has only been reported in Spain, Australia and California (Little and Rezaian 2003).

CEVd belongs to the *Pospiviroid* genus, *Pospiviroidae* family (Duran-Vila and Semancik 2003). CEVd is the causal agent of exocortis disease in citrus. The disease is characterised by bark scaling, yellow blotching of twigs and severe stunting of susceptible citrus varieties (Duran-Vila and Semancik 2003). CEVd is symptomless in most citrus varieties but disease symptoms occur on susceptible rootstocks including *Poncirus trifoliata*, Rangpur lime, Swingle citrumelo and citrange (Hardy *et al.* 2008). CEVd can also infect tomato (Verhoeven *et al.* 2004) and carrot (Fagoaga and Duran-Vila 1996); and has been detected in symptomless grapevine (Little and Rezaian 2003), broad bean (Fagoaga *et al.* 1995), eggplant, turnip (Fagoaga and Duran-Vila 1996), and *Impatiens* and *Verbena* varieties (Singh *et al.* 2009).

Citrus exocortis viroid consists of 371 to 375 nucleotides (Singh *et al.* 2009) with a number of sequence variants reported (Duran-Vila and Semancik 2003). The viroid associates with host membranes and nuclei (Semancik 1980). In tomato, it has been detected in both vascular tissues and the nuclei of mesophyll cells, with the highest viroid concentrations reported to be in the leaves (Bonfiglioli *et al.* 1996). In citrus, CEVd is found in the plant sap and is spread via mechanical means through budding, grafting, pruning and hedging (Hardy *et al.* 2008). Transmission of CEVd to citrus seeds has not been demonstrated (Duran-Vila and Semancik 2003; Hardy *et al.* 2008). However, in grapevine, CEVd transmission from seed to seedling has been observed using reverse transcription PCR (Wan Chow Wah and Symons 1997). CEVd has also been detected in seeds and seedlings of *Impatiens* and *Verbena* plants (Singh *et al.* 2009), and in tomato seedlings (Mink 1993). There are no known insect vectors of CEVd (Hardy *et al.* 2008).

In Australia, exocortis disease in citrus has largely been controlled by the use of viroid-free citrus budwood (Hardy *et al.* 2008).

The risk scenario of concern for citrus exocortis viroid is the importation of grape bunches infected with CEVd, germination of infected seed disseminated in fruit waste, seed-transmission of the viroid, survival of infected seedlings, and the transmission of CEVd to other host plants in Western Australia.

Citrus exocortis viroid was included in the final import risk analysis for fresh Unshu mandarin fruit from Shizuoka Prefecture in Japan (Biosecurity Australia 2009). In that assessment, the potential for establishment and/or spread in the pest risk assessment area was assessed as ‘not feasible’ as the viroid is not reported to be vectored or seed transmitted in citrus. As a result, no pest risk assessment was required.

Citrus exocortis viroid was also included in the existing import policy for table grapes from California to Western Australia (DAFF 2013). The assessment of CEVd presented in that assessment differs in that there are reports for seed transmission of CEVd in grapevine (Wan Chow Wah and Symons 1997). Accordingly, the assessment for table grapes from California to Western Australia concluded there is a potential for establishment and/or spread of this viroid in Western Australia and a pest risk assessment was conducted. The assessment of citrus exocortis viroid presented here builds on this existing policy.

The probability of importation for CEVd was rated as 'high' in the assessment for table grapes from California to Western Australia (DAFF 2013).

The probability of distribution for CEVd was rated as 'low' in the assessment for table grapes from California to Western Australia (DAFF 2013). The probability of distribution after arrival in Australia of CEVd will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which CEVd is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that citrus exocortis viroid will be imported into Western Australia with table grapes from Japan.

4.23.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that citrus exocortis viroid will arrive in Western Australia with the importation of table grapes from Japan is: **Very low**.

Supporting information for this assessment is provided below:

- The viroid is present on citrus in Japan (Sano 2003b). However, the viroid seems to be mainly limited to citrus trees in agricultural research stations and no serious damage to commercial orchards has been observed (Sano 2003b). In an investigation into the distribution of citrus viroids in Japan, CEVd was only detected occasionally (Ito *et al.* 2003). No reports were found for grapevine in Japan. As CEVd infects grapevines asymptomatically (Little and Rezaian 2003), the viroid may be present in Japanese vineyards without being detected. However, none of 143 grapevine leaf or fruit samples collected from major grapevine cultivating areas in Japan tested positive for CEVd (Jiang *et al.* 2012).
- CEVd is present in the vascular tissue of tomatoes (Bonfiglioli *et al.* 1996), the sap of citrus plants (Hardy *et al.* 2008) and in grape seeds (Wan Chow Wah and Symons 1997). It is therefore feasible that CEVd infection can occur systemically and the viroid could be present in stems and berries of grape bunches harvested from CEVd infected plants.
- Infected, symptomless grape bunches will not be detected during harvesting and packing processes.
- After a two-year storage period of *Impatiens walleriana* and *Verbena* x *hybrid* seeds at 4 °C, CEVd was detected in both the non-germinated seeds and, once germinated, in the

seedlings (Singh *et al.* 2009). In *Impatiens walleriana*, the presence of CEVd in seeds after two years at 4 °C was 6 per cent and the transmission rate in seedlings was 26 per cent, while the respective figures in *Verbena* x *hybrid* were 5 per cent and 45 per cent (Singh *et al.* 2009). The long-term survival of CEVd in *Impatiens* and *Verbena* seeds at 4 °C (Singh *et al.* 2009) indicates that the viroid may also remain viable in grape seeds during the period from harvest to arrival in Australia, including a period of cold storage and transport.

- Japan intends to export both seeded and seedless grape cultivars to Australia. However, the volume of seeded grapes to be imported from Japan will be very small since Japan has limited export capacity and the total export volume of table grapes to Australia will be very low.

The potential presence of the viroid in grape bunches from infected plants due to the systemic infection by the viroid, the asymptomatic infection of grapevine, its stability for long periods and during cold storage, moderated by the fact that CEVd was not found in grapevine in a survey in Japan support a likelihood estimate for importation of 'very low'.

Probability of distribution

As indicated above, the probability of distribution for citrus exocortis viroid assessed here would be the same as that for citrus exocortis viroid for table grapes from California to Western Australia (DAFF 2013), that is **Low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that citrus exocortis viroid will enter Western Australia as a result of trade in table grapes from and be distributed in a viable state to a susceptible host is: **Very low**.

4.23.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for citrus exocortis viroid assessed here would be the same as that for citrus exocortis viroid for table grapes from California to Western Australia (DAFF 2013). That assessment used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessment are presented below:

Probability of establishment:	**High**
Probability of spread:	**Moderate**

4.23.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that citrus exocortis viroid will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Very low**.

4.23.4 Consequences

The consequences of the establishment of citrus exocortis viroid in Western Australia have been estimated previously for table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**B**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**A**
International trade	**C**
Environment	**A**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for citrus exocortis viroid are estimated to be: **Low**.

4.23.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for citrus exocortis viroid	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for citrus exocortis viroid has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.24 Grapevine yellow speckle viroids

Grapevine yellow speckle viroid-1[EP, WA] and *Grapevine yellow speckle viroid-3*[EP]

Grapevine yellow speckle viroid-1 (GYSVd-1) and *Grapevine yellow speckle viroid-3* (GYSVd-3) have been identified as the causal agent for yellow speckle disease in grapevine.

GYSVd-1 has been detected in Australia (Little and Rezaian 2003; Benson *et al.* 2008; Jiang *et al.* 2012) but has not been recorded in the state of Western Australia (WA) and is a pest of quarantine concern for that state (DAWA 2006a). GYSVd-3 is not known to be present in Australia and is a pest of quarantine concern for all of Australia.

Both GYSVd-1 and GYSVd-3 belong to the *Apscaviroid* genus within the Pospiviroidae family (Little and Rezaian 2003). It was recently proposed that GYSVd-3 is a new species of *Apscaviroid* based on sequence analysis, even though phylogenetic analysis indicates GYSVd-3 is closely related to GYSVd-1 (Jiang *et al.* 2009). GYSVd-1 and GYSVd-3 have been grouped together because of their related biology and taxonomy. They are predicted to pose a similar risk and to require similar mitigation measures. Unless explicitly stated otherwise, the information presented here is considered applicable to both GYSVds assessed.

GYSVds are only known to infect grapevine (Martelli 1993; Little and Rezaian 2003; Jiang *et al.* 2012). GYSVd-1 (and likely GYSVd-3) have been shown to cause grapevine yellow speckle disease (Martelli 1993; Little and Rezaian 2003; Jiang *et al.* 2012). Although grapevines infected with GYSVds may show yellow speckle disease symptoms (Little and Rezaian 2003), there is no published evidence of a significant adverse effect of infection on yield; many infected clones still seem to give acceptable yields and quality and show no signs of degeneration (Krake *et al.* 1999). One study did not detect any effect in grape yield, although grape juice from infected plants was lower in titratable acidity, slightly higher in pH, and had reduced vegetative growth as measured by pruning weight (Wolpert *et al.* 1996). It has also been suggested that severe cases of yellow speckle disease could possibly reduce growth and yield due to reduced levels of photosynthesis from infected leaves (Little and Rezaian 2003). Additionally, grapevines may produce vein-banding disease symptoms when concurrently infected with both GYSVd-1 and grapevine fanleaf virus (Little and Rezaian 2003; CIHEAM 2006; Jiang *et al.* 2012). Mixed infections involving GYSVd-1 and other grapevine infecting viroids in cultivated grapevines are common and in general, grapevine viroids produce few or no symptoms (Jiang *et al.* 2009).

GYSVds are disseminated by vegetative propagation and transmitted by grafting (Martelli 1993; Krake *et al.* 1999; CIHEAM 2006). Spread within vineyards has been reported and may involve mechanical transmission by contaminated tools (Martelli 1993; Krake *et al.* 1999; Little and Rezaian 2003). Transmission of GYSVd-1 in grape seeds has been shown (Wan Chow Wah and Symons 1997) and GYSVds have previously been detected in grape seedlings (Little and Rezaian 2003). It is believed that GYSVd-3, being closely related to GYSVd-1, would also be seed-transmitted.

The risk scenario of concern for GYSVds is the importation of grape bunches infected with one or both of the viroids, germination of infected seed, survival of infected seedlings and the transmission of one or both of the viroids to other grapevines.

GYSVd-1 and GYSVd-3 were assessed in the existing import policy for table grapes from China (Biosecurity Australia 2011a). GYSVd-1 was included in the existing import policy for table grapes from California to Western Australia (DAFF 2013). The assessment of GYSVd-1 and GYSVd-3 presented here builds on these existing policies.

The probability of importation was rated as 'high' for GYSVd-1 and GYSVd-3 in the assessment for table grapes from China (Biosecurity Australia 2011a) and 'high' for GYSVd-1 for table grapes from California to Western Australia (DAFF 2013).

The probability of distribution for GYSVd-1 and GYSVd-3 was rated as 'moderate' in the assessment for table grapes from China (Biosecurity Australia 2011a). However, due to further consideration of the biology of these viroids, the probability of distribution was reassessed as 'low' for GYSVd-1 for table grapes from California to Western Australia (DAFF 2013). The probability of distribution after arrival of GYSVd-1 in Western Australia and of GYSVd-3 in Australia with table grapes from Japan will not differ from the distribution of GYSVd-1 with table grapes from California. The probability of establishment and of spread for GYSVd-1 in Western Australia or for GYSVd-3 in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Western Australia or Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that GYSVd-1 will be imported into Western Australia and/or GYSVd-3 into Australia with table grapes from Japan.

4.24.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that GYSVd-1 will arrive in Western Australia and/or GYSVd-3 in Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- GYSVd-1 has been detected on grapevine in Japan (Sano 2003b; Jiang *et al.* 2012; NIAS 2013) and has spread widely in commercial vineyards (Jiang *et al.* 2012). GYSVd-3 has also been isolated from grapevine in Japan (Jiang *et al.* 2012).
- The level of yellow speckle disease symptoms resulting from GYSVd infection can vary greatly, depending on factors such as grapevine cultivar, the sequence variant of the viroid and climatic conditions (Martelli 1993; Little and Rezaian 2003; CIHEAM 2006). Leaves may develop small yellowish flecks scattered along the major and minor veins, which may result in a vein banding pattern (Little and Rezaian 2003). Symptoms appear in midsummer, usually on a limited number of mature leaves and persist for the rest of the vegetative season (CIHEAM 2006). Most infected vines show no symptoms or an erratic expression pattern from one season to the next, with very few leaves affected (Koltunow *et al.* 1989; Little and Rezaian 2003).

- In Japan, GYSVds can be present as an asymptomatic infection in grapevines (Sano 2003b). No report of symptoms on fruit was found.
- In Australia, when GYSVd-1 symptoms occur early, the speckles on leaves bleach and by late summer they appear white. Speckles that develop mid-season are paler yellow and those that develop during late summer tend to be light green (Little and Rezaian 2003).
- GYSVd-1 infection has been observed in grape seeds (Wan Chow Wah and Symons 1997). GYSVds have previously been detected in grape seedlings (Little and Rezaian 2003). GYSVd-3, being closely related to GYSVd-1, may also be seed-transmitted.
- Fruit from infected vines that are asymptomatic may be harvested and exported. Normal grapes carrying GYSVd infected seed might be imported into Australia.

The potential for asymptomatic infection of grapevine and asymptomatic grapes from GYSVd infected plants may be packed for export support a likelihood estimate for importation of 'high'.

Probability of distribution

As indicated above, the probability of distribution for GYSVd-1 in Western Australia and/or GYSVd-3 in Australia assessed here would be the same as that for GYSVd-1 for table grapes from California to Western Australia (DAFF 2013), that is **Low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that GYSVd-1 will enter Western Australia and/or GYSVd-3 in Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.24.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for GYSVd-1 and/or GYSVd-3 assessed here would be the same as that for table grapes from China (Biosecurity Australia 2011a), which was adopted for GYSVd-1 for table grapes from California to Western Australia (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**Low**
Probability of spread:	**Low**

4.24.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that GYSVd-1 will enter Western Australia and/or GYSVd-3 will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and/or Australia and subsequently spread within the PRA areas is: **Very low**.

4.24.4 Consequences

The consequences of the establishment of GYSVd-1 in Western Australia and/or GYSVd-3 in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for GYSVd-1 for table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**A**
International trade	**B**
Environment	**A**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for GYSVd are estimated to be: **Low**.

4.24.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for GYSVd-1 and GYSVd-3	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Grapevine yellow speckle viroid-1* and *Grapevine yellow speckle viroid-3* has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for these pests.

4.25 Hop stunt viroid

Hop stunt viroid[EP, WA]

Hop stunt viroid (HSVd) is not present in Western Australia (DAWA 2006a) and is a pest of quarantine concern for that state. In Australia, it is known to be present in South Australia and Victoria (Koltunow *et al.* 1988).

The disease hop stunt was first observed in hop (*Humulus lupulus*) cultivated in Japan in the 1950s (Little and Rezaian 2003) and it was hypothesised that hop planting material imported mainly from Germany and the US was the likely source of the disease (Hadidi *et al.* 2003a). The first incidence of hop stunt disease emerged somewhere around the Nagano and Fukushima prefectures. Both areas are popular fruit production centres and it is not uncommon to have hop gardens adjoining vineyards (Sano 2003a). The HSVd isolates identified in hop from Japan form a single clade with the isolates recovered from grapevines (Sano 2003a) and the emerging consensus was that the viroid was transmitted from grapevines into hop. The molecular work of Sano *et al.* (1986), testing viroid isolates from grapevines imported into Japan, suggested that grapevines were indeed the source of hop stunt disease in Japan. However, it was not until Kawaguchi-Ito *et al.* (2009) published their work, that the transmission of HSVd from grapevine to hop was confirmed. They showed that 15 years of persistent infection in hop resulted in the evolution of HSVd-grapevine variants into HSVd-hop variants identical to those responsible for the hop stunt epidemic in Japan.

Although originally thought to be limited to hop in Japan, HSVd was introduced into Korea with hop rhizomes from Japan (Lee *et al.* 1988). It has also been isolated from hop in China (Guo *et al.* 2008) and is known to be widespread in hop production areas of Washington State (US), suggesting that it has been present there for some time (Eastwell and Nelson 2007). The origin of HSVd infected hop plants in China and the US has not been investigated. Given that HSVd is thought to occur in grapevines worldwide (Little and Rezaian 2003), the viroid could have transferred from grapevine to hop in China and the US via mechanical means like it did in Japan, although this has not been studied.

Despite the name, HSVd is actually associated most commonly with fruit trees, especially stone fruit, where it tends to remain symptomless (Pallas *et al.* 1998; Osman *et al.* 2012). Some sequence variants of HSVd cause plant diseases in certain hosts, which affects agronomic quality. In hop, it causes hop stunt disease (Little and Rezaian 2003). In citrus, it has been associated with the diseases cachexia (Alavi *et al.* 2006), yellow corky vein (Bagherian and Izadpanah 2009) and split bark disorder (Bagherian and Izadpanah 2009). In plums and peaches, it is associated with dapple fruit disease (Sano *et al.* 1989) although the symptoms vary with the species and cultivar (Sano 2003a; Pallás *et al.* 2003a). Its other hosts are thought to carry the viroid latently; including almond, apricot, grapevine (Astruc *et al.* 1996; Little and Rezaian 2003; Pallás *et al.* 2003a), jujube (Zhang *et al.* 2009), cherry (Osman *et al.* 2012) and pomegranate (Astruc *et al.* 1996).

HSVd is a single stranded covalently closed RNA molecule of 295–303 nucleotides which, like other members of the family *Pospiviroidae*, contains a Central Conserved Region (CCR) and a Terminal Conserved Hairpin (TCH) located in the left terminal domain, which are presently used for taxonomical classification of viroids (European Food Safety Authority 2008). In 2003, there were around 120 HSVd sequence entries in biological databases (Matoušek *et al.* 2003).

The risk scenario of concern for hop stunt viroid is the presence of the viroid in grape bunches, which includes the fruit and seed, and the woody parts of the bunch which are the peduncle, rachis, laterals and pedicels.

Hop stunt viroid was included in the existing import policy for table grapes from California to Western Australia (DAFF 2013). The assessment of hop stunt viroid presented here builds on this existing policy.

The probability of importation for hop stunt viroid was rated as 'high' in the assessment for table grapes from California to Western Australia (DAFF 2013).

The probability of distribution for hop stunt viroid was rated as 'low' in the assessment for table grapes from California to Western Australia (DAFF 2013). The probability of distribution after arrival in Australia of hop stunt viroid will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that hop stunt viroid will be imported into Western Australia with table grapes from Japan.

4.25.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that hop stunt viroid will arrive in Western Australia with the importation of table grapes from Japan is: **High**.

Supporting information for this assessment is provided below:

- HSVd is present in grapevines in Japan (Sano *et al.* 1985; Sano *et al.* 1986; Sano 2003b; Jiang *et al.* 2012). The viroid is present in most of the grapevines in commercial vineyards without showing disease symptoms (Sano 2003b).
- Hop stunt viroid is known to infect plants systemically as the viroid has been isolated from the leaves of various plants, hop cones (Yaguchi and Takahashi 1984) and fruit (Astruc *et al.* 1996). HSVd is also seed transmitted in grapes (Wan Chow Wah and Symons 1999). Grape bunches harvested from infected plants could potentially harbour HSVd in the berries, seeds and woody parts of the bunch.
- No disease symptoms have been observed in grapevines as a result of HSVd infection (Little and Rezaian 2003; Sano 2003b). The viroid is not reported to affect crop quality or yield and accordingly, no specific control practices are undertaken for HSVd in the field. Therefore, any grapes infected by HSVd that meet export standards and phytosanitary conditions could be harvested, packed and exported.
- HSVd remains stable in infected plant materials kept indoors or under refrigeration. The viroid was found to survive in hop plant leaves and cones for at least six months when kept refrigerated at 4 °C (Yaguchi and Takahashi 1984). These results indicate that

cooling of grape bunches during transport and storage is unlikely to affect the viability of the viroid.

- Japan intends to export both seeded and seedless grape cultivars to Australia. However, the volume of seeded grapes to be imported from Japan will be very small since Japan has limited export capacity and the total export volume of table grapes to Australia will be very small.

The wide distribution of HSVd in Japan, the potential presence of the viroid in grape bunches from infected plants due to the systemic infection of the viroid, the capacity for asymptomatic infection in grapevine, and its ability to persist in a viable state in its hosts for prolonged periods of time at low temperature, support a likelihood estimate for importation of ‘high’.

Probability of distribution

As indicated above, the probability of distribution for hop stunt viroid assessed here would be the same as that for hop stunt viroid for table grapes from California to Western Australia (DAFF 2013), that is **Low**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that hop stunt viroid will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.25.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for hop stunt viroid assessed here would be the same as that for hop stunt viroid for table grapes from California to Western Australia (DAFF 2013). That assessment used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessment are presented below:

Probability of establishment:	**High**
Probability of spread:	**Moderate**

4.25.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that hop stunt viroid will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Low**.

4.25.4 Consequences

The consequences of the establishment of hop stunt viroid in Western Australia have been estimated previously for table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**A**
International trade	**C**
Environment	**A**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**D**', the overall consequences for hop stunt viroid are estimated to be: **Low**.

4.25.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for hop stunt viroid	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Low**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for hop stunt viroid has been assessed as 'very low', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.26 Grapevine fanleaf virus

Grapevine fanleaf virus[EP, WA]

Grapevine fanleaf virus (GFLV) is a significant virus affecting grapevine in many countries where *Vitis vinifera* and hybrid rootstocks are cultivated (Martelli *et al.* 2001; Andret-Link *et al.* 2004; CIHEAM 2006), including Japan (MAFF 2008a).

In Australia, it is only known to be present in New South Wales, South Australia and Victoria (Emmett and Hamilton 1994; Stansbury *et al.* 2000; Habili *et al.* 2001; Plant Health Australia 2001a), but has not been recorded in Western Australia (DAWA 2006a) and is a pest of quarantine concern for that state.

GFLV is a member of the *Nepovirus* genus, Comoviridae family (Brunt *et al.* 1996a). It causes disease in most cultivars of *Vitis vinifera* including some hybrids and other *Vitis* spp. (Brunt *et al.* 1996a; Martelli *et al.* 2001; Andret-Link *et al.* 2004; Varadi *et al.* 2007). The virus has also been isolated from weeds found in vineyards (Izadpanah *et al.* 2003).

The virus is transmitted and disseminated by several mechanisms. It is transmitted through soil between grapevines by the root-feeding ectoparasitic dagger nematode *Xiphinema index*, and occasionally by *X. italiae* (Cohn *et al.* 1970; Brunt *et al.* 1996a; Martelli *et al.* 2001). Transmission by *X. vuittenezi* has also been suspected but not proven (CIHEAM 2006). *Xiphinema index*, *X. italiae* and *X. vuittenezi* are not known to be present in Western Australia (Plant Health Australia 2001a; Lantzke 2004; DAWA 2006a).

The virus is also transmitted by grafting and is probably commonly introduced to vineyards and disseminated through infected scionwood and rootstocks (Murant 1981; Martelli *et al.* 2001; Habili *et al.* 2001; Andret-Link *et al.* 2004; CABI 2011). It may be maintained in soil contaminated with viruliferous nematodes or roots (Murant 1981; Martelli *et al.* 2001). The virus is probably seed transmitted in grapevine under certain conditions. It has been detected in endosperm of grapevine seed and can occasionally be transmitted to grapevine seedlings (Cory and Hewitt 1968; Lazar *et al.* 1990; Mink 1993). The virus can be transmitted through seeds of other hosts, including soybean (CIHEAM 2006).

Infected fruit are uneven in size and immature berries may be interspersed through the bunches (Andret-Link *et al.* 2004; CIHEAM 2006). Severe symptoms occur, although not exclusively, when GFLV co-infects with grapevine yellow speckle viroid 1 or 2 (GYSVd-1, GYSVd-2) (Szychowski *et al.* 1995; Little and Rezaian 2003). Both GYSVd-1 and GYSVd-2 are present in Australia, but have not been recorded in Western Australia (DAWA 2006a). Only GYSVd-1 is present in Japan (NIAS 2012). GYSVd-1 is assessed separately in this risk analysis report.

The risk scenario of concern for GFLV is the importation of grape bunches infected with GFLV, germination of infected seed, transmission of the virus to seedlings, and transmission of GFLV from the seedlings to other grapevines in Western Australia.

GFLV was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a) and for table grapes from California to Western Australia (DAFF 2013). The assessment of GFLV presented here builds on these existing policies.

The probability of importation for GFLV was rated as ‘high’ in the assessments for table grapes from China (Biosecurity Australia 2011a) and from California to Western Australia (DAFF 2013).

The probability of distribution for GFLV was rated as ‘moderate’ in the assessments for table grapes from China (Biosecurity Australia 2011a) and from California to Western Australia (DAFF 2013). The probability of distribution after arrival in Western Australia of GFLV will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Western Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Western Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that GFLV will be imported into Western Australia with table grapes from Japan.

4.26.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that GFLV will arrive in Western Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- GFLV is a recognised virus of grapes in Japan (MAFF 2008a; NIAS 2012).
- Most long distance spread of GFLV occurs via infected propagation material (BC Ministry of Agriculture 2010).
- GFLV has been found in the endosperm of grapevine seed (Cory and Hewitt 1968).
- The leaves of infected vines may become chlorotic and the canes and leaves may grow abnormally (Stansbury *et al.* 2000; Martelli *et al.* 2001).
- Some infected vines may be removed from production in Japan.
- Infected vines may have fewer grape bunches, bunches may be smaller and berries may ripen irregularly or fail to develop (Stansbury *et al.* 2000; Martelli *et al.* 2001).
- Some infested fruit and bunches showing symptoms may be culled during harvesting, grading and packing. However some cultivars and rootstocks under certain conditions can show tolerance to infection and display little or no symptoms (Murant 1981; CIHEAM 2006; Lunden *et al.* 2008) or symptoms may disappear by midsummer (Murant 1981; Martelli *et al.* 2001). Some infected, asymptomatic fruit may therefore evade culling processes.
- Japan intends to export both seeded and seedless grape cultivars to Australia. However, the volume of seeded grapes to be imported from Japan will be very small since Japan has limited export capacity and the total export volume of table grapes to Australia will be very low.

The potential for asymptomatic fruit to carry the virus, moderated by infected fruit showing symptoms likely to be culled during harvesting and packing processes and the expected low volumes of seeded grapes to be imported from Japan, support a likelihood estimate for importation of 'moderate'.

Probability of distribution

As indicated above, the probability of distribution for GFLV assessed here would be the same as that for GFLV for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from California to Western Australia (DAFF 2013), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that GFLV will enter Western Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.26.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for GFLV assessed here would be the same as that for GFLV for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from California to Western Australia (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **Low**

Probability of spread: **Very low**

4.26.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that GFLV will enter Western Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Western Australia and subsequently spread within Western Australia is: **Extremely low**.

4.26.4 Consequences

The consequences of the establishment of GFLV in Western Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a), and were adopted for table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**A**
Eradication, control	**D**

Domestic trade	**B**
International trade	**A**
Environment	**A**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for GFLV are estimated to be: **Moderate**.

4.26.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Grapevine fanleaf virus*	
Overall probability of entry, establishment and spread	**Extremely low**
Consequences	**Moderate**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Grapevine fanleaf virus* has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.27 Tobacco necrosis viruses

The taxonomy of 'tobacco necrosis virus' (TNV) has been revised. *Tobacco necrosis virus A* (TNV-A) and *Tobacco necrosis virus D* (TNV-D) have been recognised as distinct species in the Necrovirus genus (Meulewaeter *et al.* 1990; Coutts *et al.* 1991), as have *Chenopodium necrosis virus* (ChNV) and *Olive mild mosaic virus* (OMMV), which were previously considered TNV isolates (Tomlinson *et al.* 1983; Cardoso *et al.* 2005). TNV isolates from Nebraska and Toyama (TNV-NE and TNV-Toyama) represent another species in the genus, as yet not officially recognised (Zhang *et al.* 1993; Saeki *et al.* 2001) and molecular sequence data indicates some other necroviruses called 'tobacco necrosis virus' are also distinct species (NCBI 2009).

Necroviruses are transmitted through soil. ChNV, TNV-A and TNV-D are transmitted by the root infecting chytrid fungus *Olpidium brassicae* (Wor.) Dang (Rochon *et al.* 2004; Zitikaite and Staniulis 2009) and at least one TNV strain is transmitted by the related chytrid *Olpidium virulentus* (Sasaya and Koganezawa 2006). Virus particles released from roots and other plant matter are acquired in soil water by fungal zoospores and transmitted when the spores infect the roots of a suitable host. TNV particles are stable and relatively long lived. Transmission probably only occurs when there is sufficient soil water for *Olpidium* zoospore activity (Uyemoto 1981; Spence 2001). TNV strains typically have a wide host range (Uyemoto 1981), including grapevine (Zitikaite and Staniulis 2009), and can cause sporadic disease in some vegetable crops, strawberry, tulip and soybean. A necrovirus serologically related to TNV-D has been detected in grapevine (Cesati and Van Regenmortel 1969). TNVs can cause necrosis of leaves and stems, which can consist of local lesions that may vary in colour and size (Uyemoto 1981; Brunt and Teakle 1996; Zitikaite and Staniulis 2009). Infected plant roots can transmit the virus mechanically to plant leaves (Zitikaite and Staniulis 2009). TNVs have been reported in Qld (Teakle 1988; Plant Health Australia 2001a) and Vic. (Finlay and Teakle 1969; Teakle 1988), but not on grapevine. It is not known if the species or strain that infects grapevine is present in Australia. TNVs were thought to be ubiquitous and have a world-wide distribution (Uyemoto 1981; Brunt and Teakle 1996), but this status has not been reviewed since the taxonomic revision of the viruses. A satellite virus replicates with some strains of TNV (Uyemoto 1981; Nemeth 1986; Smith *et al.* 1988).

The risk scenario of concern for TNVs is where the particles of a foreign TNV species or strain are released from fruit waste, acquired in soil by a vector and transmitted to suitable host plants. Hyacinth (*Hyacinthus* sp.), lily (*Lilium* sp.) and tulip (*Tulipa* sp.) bulbs are currently permitted for import into Australia for planting (Department of Agriculture 2013) and TNVs may enter Australia with these commodities. However, it is not known if the necrovirus species infecting monocots also infect grapevine.

TNVs were included in the existing import policy for apples from China (Biosecurity Australia 2010a), stone fruit from California, Idaho, Oregon and Washington, US (Biosecurity Australia 2010b) and table grapes from China (Biosecurity Australia 2011a).The assessment of TNVs presented here builds on these existing policies.

The probability of importation for TNVs was rated as 'moderate' in the assessments for apples from China (Biosecurity Australia 2010a), stone fruit from California, Idaho, Oregon and Washington, US (Biosecurity Australia 2010b) and table grapes from China (Biosecurity Australia 2011a).

The probability of distribution for TNVs was rated as ‘moderate’ in the assessments for apples from China (Biosecurity Australia 2010a), stone fruit from California, Idaho, Oregon and Washington, US (Biosecurity Australia 2010b) and table grapes from China (Biosecurity Australia 2011a). The probability of distribution after arrival in Australia of TNVs for table grapes from Japan would not differ for that for table grapes from China. The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that TNVs will be imported into Australia with table grapes from Japan.

4.27.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that TNVs will arrive in Australia with the importation of table grapes from Japan is: **Moderate**.

Supporting information for this assessment is provided below:

- In Japan, TNVs have been reported on grapes (MAFF 2008a; NIAS 2013), strawberry roots (Tezuka *et al.* 1974; Kaname 1974; NIAS 2013), tulip (Matsunami *et al.* 1977; NIAS 2013) and tomato (Zitikaite and Staniulis 2009; NIAS 2013). The necrovirus or TNV species involved in some of these infections were not identified using the revised taxonomy of TNVs.
- A strain of TNV was also found naturally infecting several grapevine cultivars in South Africa (Cesati and Van Regenmortel 1969). The taxonomy, incidence and global distribution of the grapevine-infecting TNVs are not known.
- The strain of TNV found in grapevine in South Africa is graft-transmissible and spreads systemically in grapevine (Cesati and Van Regenmortel 1969). The virus is likely to be in berries.
- TNVs can infect a few species systemically (Kassanis 1970; Uyemoto 1981) although some TNV species and strains may not infect grapevine systematically and may not be in berries. Detectable systemic infection only occurs with certain combinations of host species and TNV species or strains (Kassanis 1970; Uyemoto 1981; Brunt and Teakle 1996).
- Some fruit species infected with TNV may not show adverse effects (Nemeth 1986). TNV usually causes necrotic lesions (Kassanis 1970), but no record was found indicating that infected grapevine showed symptoms.

The likelihood of systemic infection of grapevine and the uncertainty about the incidence and distribution of infections, support a likelihood estimate for importation of ‘moderate’.

Probability of distribution

As indicated above, the probability of distribution for TNV assessed here would be the same as that for TNVs for table grapes from China (Biosecurity Australia 2011a), that is **Moderate**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that TNV will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Low**.

4.27.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for TNV assessed here would be the same as that for TNV for apples from China (Biosecurity Australia 2010a) and stone fruit from California, Idaho, Oregon and Washington, US (Biosecurity Australia 2010b), which was adopted for table grapes from China (Biosecurity Australia 2011a). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment:	**High**
Probability of spread:	**High**

4.27.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that TNV will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Low**.

4.27.4 Consequences

The consequences of the establishment of TNV in Australia have been estimated previously for apples from China (Biosecurity Australia 2010a) and stone fruit from California, Idaho, Oregon and Washington, US (Biosecurity Australia 2010b), and were adopted for table grapes from China (Biosecurity Australia 2011a). This estimate of impact scores is provided below:

Plant life or health	**C**
Other aspects of the environment	**A**
Eradication, control	**C**
Domestic trade	**C**
International trade	**C**
Environment	**A**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**C**', the overall consequences for TNV are estimated to be: **Very low**.

4.27.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Tobacco necrosis viruses*	
Overall probability of entry, establishment and spread	**Low**
Consequences	**Very low**
Unrestricted risk	**Negligible**

As indicated, the unrestricted risk estimate for *Tobacco necrosis viruses* has been assessed as 'negligible', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.28 Tomato ringspot virus

Tomato ringspot virus[EP]

Tomato ringspot virus (ToRSV) is a member of the *Nepovirus* genus, Comoviridae family (CABI-EPPO 1997f). It causes disease in *Vitis* spp. (grapes) as well as a wide range of other cultivated plants including *Malus domestica* (apple), *Prunus* spp. (almond, apricot, nectarine, peach, plum, prune and sweet cherry) and *Rubus* spp. (blackberry and raspberry) (Brunt *et al.* 1996b; CABI-EPPO 1997f).

The virus has been reported in Japan infecting narcissus (*Narcissus* spp.), melon (*Cucumis* spp.) and petunia (*Petunia* spp.) (Iwaki and Komuro 1971; CABI-EPPO 1997f; NIAS 2013). ToRSV was reported more than two decades ago in *Pentas lanceolata* (Egyptian starflower) in South Australia (Chu *et al.* 1983). The infected plants were removed and it has not been detected since that time in South Australia, suggesting it has not spread and is probably now absent from Australia (Cartwright 2009).

ToRSV may be transmitted and disseminated by several mechanisms. It is transmitted through soil between host plants by root-feeding ectoparasitic dagger nematodes of the *Xiphinema americanum* group (Stace-Smith 1984; CABI-EPPO 1997f). *Xiphinema americanum* is present in NSW, Qld, SA and Vic. (Plant Health Australia 2001a). The virus is also transmitted by grafting (Stace-Smith 1984; Brunt *et al.* 1996b) and may be introduced to orchards and vineyards with infected propagation material (Gonsalves 1988). The virus may be maintained in soil contaminated with viruliferous nematodes or remnant roots (Murant 1981; Gonsalves 1988; Pinkerton *et al.* 2008). ToRSV has been demonstrated as seed transmitted in several plant species including grapes (Uyemoto 1975; Gonsalves 1988; CABI-EPPO 1997f) and common orchard weeds such as the common dandelion (*Taraxacum officinale*) (Stace-Smith 1984; Powell *et al.* 1984; Gonsalves 1988), which can serve as a reservoir host of the virus (Powell *et al.* 1984; CABI-EPPO 1997f). The common dandelion is present in both Japan and Australia (CABI 2011).

The risk scenario of concern for ToRSV is the importation of fruit infected with ToRSV, germination of contaminated seed, survival of infected seedlings and the transmission of ToRSV to other host plants in Australia.

ToRSV was included in the existing import policy for table grapes from China (Biosecurity Australia 2011a), table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). The assessment of ToRSV presented here builds on these existing policies.

The probability of importation for ToRSV was rated as ‘low’ in the assessment for table grapes from China (Biosecurity Australia 2011a), ‘very low’ for table grapes from Korea (Biosecurity Australia 2011b) and ‘moderate’ for table grapes from California to Western Australia (DAFF 2013).

The probability of distribution for ToRSV was rated as ‘moderate’ in the assessment for table grapes from China (Biosecurity Australia 2011a), table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). The probability of distribution after arrival in Australia of ToRSV will not differ for the same commodity (here: table grapes). The probability of establishment and of spread in Australia, and the consequences it may cause will be the same for any commodity with which the species is imported into Australia. Accordingly, there is no need to reassess these components.

However, differences in horticultural practices, climate conditions and the prevalence of pests between previous export areas and Japan make it necessary to reassess the likelihood that ToRSV will be imported into Australia with table grapes from Japan.

4.28.1 Probability of entry

The probability of entry is considered in two parts, the probability of importation and the probability of distribution, which consider pre-border and post-border issues, respectively.

Probability of importation

The likelihood that ToRSV will arrive in Australia with the importation of table grapes from Japan is: **Very low**.

Supporting information for this assessment is provided below:

- ToRSV has been reported in large cupped narcissus (*Narcissus* spp.), melon (*Cucumis* spp.) and petunia (*Petunia* spp.) in Japan (Iwaki and Komuro 1971; NIAS 2013). The virus has also been detected in the potential nematode vector *X. americanum* collected from soils around grapevine in Chiba, Japan (Iwaki and Komuro 1974). No information was found on the distribution of ToRSV in Japan.
- ToRSV may be transmitted through soil between host plants by root-feeding ectoparasitic dagger nematodes of the *X. americanum* group (Stace-Smith 1984; CABI-EPPO 1997f). Although ToRSV has been recorded in *X. americanum* in Japan almost four decades ago (Iwaki and Komuro 1974), there have been no records found of ToRSV being detected on grapevines in Japan.
- ToRSV (*sensu lato*) and some strains of the virus have wide host ranges and infect common weed species as well as cultivated plants (Stace-Smith 1984; Powell *et al.* 1984; Brunt *et al.* 1996b; CABI-EPPO 1997f).
- Common dandelion (*Taraxacum officinale*) can serve as a reservoir host of the virus (Powell *et al.* 1984; CABI-EPPO 1997f). The common dandelion is present in Japan (CABI 2011).
- Two strains of ToRSV found in the US, the yellow vein and the decline strains, infect grapevine systemically (Gooding Jr 1963; Gilmer and Uyemoto 1972). It is possible that some ToRSV strains may not infect grapevine systemically.
- At least one strain of ToRSV was reported to be transmitted at a low rate through the seed of infected grapevine (Uyemoto 1975).
- Infected vines may produce small grape bunches and the berries may develop unevenly and be small; some vines may produce no fruit (Gilmer and Uyemoto 1972; Dias 1977; CABI 2011). Poorly developed grape bunches are unlikely to be harvested and packed for export.
- ToRSV symptoms can vary in severity between vines (CABI 2011), grape cultivars and strains of the virus (Gonsalves 1988). Infected grapevines in the US were symptomless,

or nearly so during the first year of infection (Gonsalves 1988). Asymptomatic grape bunches will not be detected and bunches with mild symptoms may escape detection.

The detection of the virus in the *X. americanum* collected from soils around grapevine in one area in Japan, the possible asymptomatic infection of grapevine, moderated by the lack of reports of this virus on grapevine in Japan, support a likelihood estimate for importation of 'very low'.

Probability of distribution

As indicated above, the probability of distribution for ToRSV assessed here would be the same as that for ToRSV for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013), that is **MODERATE**.

Overall probability of entry

The overall probability of entry is determined by combining the probability of importation and of distribution using the matrix of rules shown in Table 2.2.

The likelihood that ToRSV will enter Australia as a result of trade in table grapes from Japan and be distributed in a viable state to a susceptible host is: **Very low**.

4.28.2 Probability of establishment and of spread

As indicated above, the probability of establishment and of spread for ToRSV assessed here would be the same as that for ToRSV for table grapes from China (Biosecurity Australia 2011a), which was adopted for table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). Those assessments used the same methodology as described in Chapter 2 of this report. The ratings from the previous assessments are presented below:

Probability of establishment: **Low**

Probability of spread: **Moderate**

4.28.3 Overall probability of entry, establishment and spread

The overall probability of entry, establishment and spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of rules shown in Table 2.2.

The likelihood that ToRSV will enter Australia as a result of trade in table grapes from Japan, be distributed in a viable state to a susceptible host, establish in Australia and subsequently spread within Australia is: **Very low**.

4.28.4 Consequences

The consequences of the establishment of ToRSV in Australia have been estimated previously for table grapes from China (Biosecurity Australia 2011a) and were adopted for table grapes from Korea (Biosecurity Australia 2011b) and table grapes from California to Western Australia (DAFF 2013). This estimate of impact scores is provided below:

Plant life or health	**E**
Other aspects of the environment	**A**
Eradication, control	**D**
Domestic trade	**C**
International trade	**C**
Environment	**B**

Based on the decision rules described in Table 2.4, that is, where the consequences of a pest with respect to one or more criteria are '**E**', the overall consequences for ToRSV are estimated to be: **Moderate**.

4.28.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the probability of entry, establishment and spread with the estimate of consequences. Probabilities and consequences are combined using the risk estimation matrix shown in Table 2.5.

Unrestricted risk estimate for *Tomato ringspot virus*	
Overall probability of entry, establishment and spread	**Very low**
Consequences	**Moderate**
Unrestricted risk	**Very low**

As indicated, the unrestricted risk estimate for *Tomato ringspot virus* has been assessed as 'very low', which achieves Australia's ALOP. Therefore, no specific risk management measures are required for this pest.

4.29 Pest risk assessment conclusions

Key to Table 4.2 (starting next page)

Genus species EP	pests for which policy already exists. The outcomes of previous assessments and/or reassessments in this report are presented in Table 4.2
Genus species state/territory	state/territory in which regional quarantine pests have been identified

Likelihoods for entry, establishment and spread

N	negligible
EL	extremely low
VL	very low
L	low
M	moderate
H	high
P[EES]	overall probability of entry, establishment and spread

Assessment of consequences from pest entry, establishment and spread

PLH	plant life or health
OE	other aspects of the environment
EC	eradication, control etc.
DT	domestic trade
IT	international trade
ENC	environmental and non-commercial
A–G	consequence impact scores are detailed in section 2.2.3
	A Indiscernible at the local level
	B Minor significance at the local level
	C Significant at the local level
	D Significant at the district level
	E Significant at the regional level
	F Significant at the national level
	G Major significance at the national level
URE	unrestricted risk estimate. This is expressed on an ascending scale from negligible to extreme.

Table 4.2 Summary of unrestricted risk estimates for quarantine pests associated with table grapes from Japan

Pest name	Likelihood of						Consequences							URE
	Entry			Establishment	Spread	P[EES]								
	Importation	Distribution	Overall				Direct		Indirect				Overall	
							PLH	OE	EC	DT	IT	ENC		
Ladybird (Coleoptera: Coccinellidae)														
Harmonia axyridis EP	L	H	L	H	H	L	C	D	D	E	D	E	M	**L**
Beetle (Coleoptera: Scarabaeidae)														
Popillia japonica EP	L	H	L	H	H	L	E	E	E	D	C	D	M	**L**
Fruit fly (Diptera: Drosophilidae)														
Drosophila suzukii EP (for *Vitis vinifera*)	M	H	M	H	H	M	F	B	E	E	E	D	H	**H**
Drosophila suzukii EP (for *Vitis labrusca*)	VL	H	VL	H	H	VL	F	B	E	E	E	D	H	**L**
Whitefly (Hemiptera: Aleyrodidae)														
Aleurolobus taonabae EP	L	M	L	H	H	L	E	B	D	D	C	B	M	**L**
Mealybugs (Hemiptera: Pseudococcidae)														
Crisicoccus matsumotoi EP	H	M	M	H	H	M	D	C	D	D	D	B	L	**L**
Planococcus kraunhiae EP	H	M	M	H	H	M	D	C	D	D	D	B	L	**L**
Planococcus lilacinus EP	H	M	M	H	H	M	D	C	D	D	D	B	L	**L**
Pseudococcus comstocki EP	H	M	M	H	H	M	D	C	D	D	D	B	L	**L**
Phylloxera (Hemiptera: Phylloxeridae)														
Daktulosphaira vitifoliae EP	M	M	L	H	M	L	E	A	E	D	C	B	M	**L**
Soft scale (Hemiptera: Coccidae)														
Parthenolecanium corni WA, EP	M	L	L	H	M	L	D	B	D	C	C	B	L	**VL**

Pest name	Likelihood of						Consequences							URE
	Entry			Establishment	Spread	P[EES]								
	Importation	Distribution	Overall				Direct		Indirect				Overall	
							PLH	OE	EC	DT	IT	ENC		
Tortricid moths (Lepidoptera: Tortricidae)														
Eupoecilia ambiguella [EP]	L	M	L	H	H	L	E	D	E	D	D	B	M	**L**
Sparganothis pilleriana [EP]	L	M	L	H	H	L	E	D	E	D	D	B	M	**L**
Plume moths (Lepidoptera: Pterophoridae)														
Nippoptilia vitis [EP]	L	L	VL	L	L	VL	D	A	B	C	C	B	L	**N**
Platyptilia ignifera	L	L	VL	L	L	VL	D	A	B	C	C	B	L	**N**
Moth (Lepidoptera: Oecophoridae)														
Stathmopoda auriferella [EP]	L	H	L	H	H	L	C	B	C	D	D	B	L	**VL**
Spider Mite (Prostigmata: Tetranychidae)														
Tetranychus kanzawai [WA, EP]	H	M	M	H	M	L	E	B	D	C	D	B	M	**L**
Thrips (Thysanoptera: Thripidae)														
Drepanothrips reuteri [EP]	H	M	M	H	H	M	D	B	D	D	D	B	L	**L**
Frankliniella occidentalis [NT, EP]	H	M	M	H	H	M	D	B	D	D	D	B	L	**L**
Bacteria														
Xylophilus ampelinus	L	VL	VL	H	M	VL	E	A	D	D	D	B	M	**VL**
Fungi														
Diaporthe melonis var. *brevistylospora*	M	VL	VL	H	M	VL	C	A	C	D	D	B	L	**N**
Greeneria uvicola [WA]	H	VL	VL	L	L	VL	D	A	D	A	C	B	L	**N**
Guignardia bidwellii [EP]	M	M	L	M	H	L	F	A	E	D	D	B	H	**M**
Monilinia fructigena [EP]	L	H	L	H	H	L	E	B	E	E	E	B	M	**L**
Monilia polystroma	L	H	L	H	H	L	E	B	E	E	E	B	M	**L**

Pest name	Likelihood of						Consequences							URE
	Entry			Establishment	Spread	P[EES]								
	Importation	Distribution	**Overall**				Direct		Indirect				**Overall**	
							PLH	**OE**	**EC**	**DT**	**IT**	**ENC**		
Pestalotiopsis menezesiana [WA]	M	VL	VL	H	H	VL	D	A	B	A	B	B	L	**N**
Pestalotiopsis uvicola [WA]	M	VL	VL	H	H	VL	D	A	B	A	B	B	L	**N**
Phakopsora euvitis [EP]	M	M	L	M	H	L	E	A	D	D	D	B	M	**L**
Phomopsis sp.	M	VL	VL	H	M	VL	C	A	C	D	D	B	L	**N**
Phomopsis viticola [WA, EP]	M	VL	VL	H	M	VL	C	A	D	B	B	B	L	**N**
Physalospora baccae [EP]	H	M	M	H	H	M	E	A	E	E	D	B	M	**M**
Pilidiella castaneicola [WA]	M	M	L	M	M	L	D	A	C	A	D	B	L	**VL**
Pilidiella diplodiella [WA]	M	M	L	M	M	L	D	A	C	A	D	B	L	**VL**
Viroids														
Citrus exocortis viroid [WA]	VL	L	VL	H	M	VL	B	A	D	A	C	A	L	**N**
Grapevine yellow speckle viroid-1 [WA, EP]	H	L	L	L	L	VL	C	A	D	A	B	A	L	**N**
Grapevine yellow speckle viroid-3 [EP]	H	L	L	L	L	VL	C	A	D	A	B	A	L	**N**
Hop stunt viroid [WA, EP]	H	L	L	H	M	L	C	A	D	A	C	A	L	**VL**
Viruses														
Grapevine fanleaf virus [WA, EP]	M	M	L	L	VL	EL	E	A	D	B	A	A	M	N
Tobacco necrosis viruses [EP]	M	M	L	H	H	L	C	A	C	C	C	A	VL	**N**
Tomato ringspot virus [EP]	VL	M	VL	L	M	VL	E	A	D	C	C	B	M	**VL**

5 Pest risk management

This chapter provides information on the management of quarantine pests identified with an unrestricted risk exceeding Australia's appropriate level of protection (ALOP). The recommended phytosanitary measures are described in this chapter.

5.1 Pest risk management measures and phytosanitary procedures

Pest risk management evaluates and selects options for measures to reduce the risk of entry, establishment or spread of quarantine pests for Australia where they have been assessed to have an unrestricted risk above Australia's ALOP. In calculating the unrestricted risk, existing commercial production practices in Japan have been considered, as have post-harvest and packing procedures.

In addition to Japan's existing commercial production practices for table grapes and minimum border procedures in Australia, specific pest risk management measures are recommended to achieve Australia's ALOP.

In this section, the Australian Department of Agriculture has identified risk management measures that may be applied to consignments of table grapes sourced from Japan. Finalisation of the risk management measures may be undertaken with input from the Australian states and territories as appropriate.

5.1.1 Pest risk management for quarantine pests

The pest risk assessments (Chapter 4) identified the quarantine pests listed in Table 5.1 as having an unrestricted risk above Australia's ALOP.

Table 5.1 Phytosanitary measures recommended for quarantine pests for table grapes from Japan

Pest	Common name	Measures
Arthropods		
Harmonia axyridis [EP]	Harlequin ladybird	Pre-export visual inspection and remedial action by MAFF* AND On-arrival/offshore pre-shipment inspection and remedial action by the Australian Department of Agriculture
Popillia japonica [EP]	Japanese beetle	
Aleurolobus taonabae [EP]	Grape whitefly	
Crisicoccus matsumotoi [EP]	Matsumoto mealybug	
Planococcus kraunhiae [EP]	Japanese mealybug	
Planococcus lilacinus [EP]	Coffee mealybug	
Pseudococcus comstocki [EP]	Comstock's mealybug	
Eupoecilia ambiguella [EP]	Grape berry moth	
Sparganothis pilleriana [EP]	Grapevine leaf roller	
Tetranychus kanzawai [EP, WA]	Kanzawa spider mite	
Drepanothrips reuteri [EP]	Grape thrips	
Frankliniella occidentalis [EP, NT]	Western flower thrips	
Drosophila suzukii [EP]	Spotted wing drosophila	Area freedom** OR Systems approach OR Fruit treatment known to be effective against all life stages of *Drosophila suzukii* (for example SO_2/CO_2 fumigation, followed by cold treatment)
Daktulosphaira vitifoliae [EP]	Grapevine phylloxera	Area freedom** OR Fruit treatment known to be effective against all life stages of *Daktulosphaira vitifoliae* (for example sulphur pad treatment)
Pathogens		
Guignardia bidwellii [EP]	Black rot	Area freedom** OR Systems approach
Physalospora baccae [EP]	Grape cluster black rot	
Monilinia fructigena [EP]	Brown rot	
Monilia polystroma	Asiatic brown rot	
Phakopsora euvitis [EP]	Grape rust fungus	

* Remedial action by MAFF may include: withdrawing the consignment from export to Australia or approved treatment of the consignment to ensure that the pest is no longer viable.

Remedial action by the Australian Department of Agriculture may include: rejecting the consignment for export to Australia (if detected pre-export during offshore inspection), re-exporting or destroying the consignment (if detected during on-arrival inspection) or suitable treatment of the consignment to ensure that the pest is no longer viable.

** Area freedom may include pest free areas, pest free places of production or pest free production sites

[EP]: Species has been assessed previously and import policy already exists

[WA]: Pests of regional concern for Western Australia only

[NT]: Pests of regional concern for the Northern Territory only

This non-regulated analysis of existing policy builds on the existing policies for the import of table grapes from California (AQIS 1999a; AQIS 2000; Biosecurity Australia 2006; DAFF 2013), Chile (Biosecurity Australia 2005), China (Biosecurity Australia 2011a), and Korea (Biosecurity Australia 2011b), which include most of the pests identified in Table 5.1.

Considerable trade in table grapes from California has taken place since 2002. To date, no table grapes have been imported under the policy for table grapes from Chile, China or Korea.

Equivalent management measures have been considered for the same or similar pests and recommended in this report. Thus, the management options recommended in this report are consistent with the existing policies. Where there are differences in the recommended risk management measures among the existing policies, those recommended for table grapes from California (DAFF 2013) were recommended in this report for table grapes from Japan because the efficacy of those measures has been supported by considerable trade.

The recommended risk management measures for table grapes from Japan include:

- visual inspection and remedial action for the ladybird, beetle, whitefly, mealybugs, leafrollers, spider mite and thrips
- area freedom, a systems approach or fruit treatment known to be effective against all life stages for spotted wing drosophila
- area freedom or fruit treatment known to be effective against all life stages for grapevine phylloxera
- area freedom or a systems approach for black rot, grape cluster black rot, Asiatic brown rot, brown rot and grape rust fungus.

Management for *Harmonia axyridis, Popillia japonica, Aleurolobus taeonabe, Crisicoccus matsumotoi, Planococcus kraunhiae, Planococcus lilacinus, Pseudococcus comstocki, Eupoecillia ambiguella, Sparganothis pilleriana, Tetranychus kanzawai, Drepanothrips reuteri* and *Frankliniella occidentalis*

Harmonia axyridis (Harlequin ladybird), *Popillia japonica* (Japanese beetle), *Aleurolobus taonabae* (grape whitefly), *Crisicoccus matsumotoi* (Matsumoto mealybug), *Planococcus kraunhiae* (Japanese mealybug), *Planococcus lilacinus* (coffee mealybug), *Pseudococcus comstocki* (Comstock's mealybug), *Eupoecillia ambiguella* (grape berry moth), *Sparganothis pilleriana* (grapevine leaf roller), *Tetranychus kanzawai* (kanzawa spider mite), *Drepanothrips reuteri* (grape thrips) and *Frankliniella occidentalis* (western flower thrips) were assessed to have an unrestricted risk estimate that exceeds Australia's ALOP. Measures are therefore required to manage the risk.

The Australian Department of Agriculture proposes visual inspection and remedial action as a measure for these pests. The objective of the recommended visual inspection is to ensure that any consignments of table grapes from Japan infested with these pests are identified and subjected to appropriate remedial action. The appropriate remedial action will reduce the risk associated with these pests to at least 'very low', which would achieve Australia's ALOP.

The recommended measure is consistent with the existing policy for table grapes from the United States of America (California) for the same, or similar, pests listed here. The existing policy for table grapes from the People's Republic of China recommends a systems approach, consisting of vineyard and packing management and visual inspection and remedial action, as a measure for the same, or similar, pests. The Australian Department of Agriculture considers that the commercial production and packing procedures for table grapes for export in Japan achieve the same outcome and are therefore equivalent to the requirements of the systems approach recommended for table grapes from the People's Republic of China. Additionally, the efficacy of visual inspection and remedial action is supported by considerable trade of table grapes from California to Australia since 2002.

The visual inspection and remedial action must be undertaken by MAFF, and then verified by visual inspection and remedial action undertaken by the Australian Department of Agriculture.

Pre-export visual inspection and remedial action by MAFF

All table grape consignments for export to Australia must be inspected by MAFF and found free of these quarantine arthropod pests. Export lots or consignments found to contain any of these pests must be subject to remedial action. Remedial action may include withdrawing the consignment from export to Australia or, if available, approved treatment of the export consignment to ensure that the pest is no longer viable.

Visual inspection and remedial action by the Australian Department of Agriculture

All table grape consignments for export to Australia are to be inspected by the Australian Department of Agriculture to verify that all table grapes for export to Australia are free of these quarantine arthropod pests. Inspection by the Australian Department of Agriculture may be undertaken on-arrival into Australia of table grape consignment or in Japan as offshore pre-shipment inspection (see more details in section 5.2.6). Export lots or consignments found to contain any of these pests will be subject to remedial action. Remedial action by the Australian Department of Agriculture may include rejecting the consignment for export to Australia (if detected during offshore pre-shipment inspection), re-exporting or destroying the consignment (if detected during on-arrival inspection) or, if available, suitable treatment of the consignment to ensure that the pest is no longer viable.

If table grape consignments repeatedly fail inspection for these pests, then the Australian Department of Agriculture reserves the right to suspend the export program and conduct an audit of the production and export systems. The program will recommence only when the department is satisfied that appropriate corrective action has been undertaken.

Management for *Drosophila suzukii*

Drosophila suzukii (spotted wing drosophila) was assessed, in the *Final pest risk analysis report for Drosophila suzukii* (DAFF Biosecurity 2013), to have an unrestricted risk estimate that exceeds Australia's ALOP. Measures are required to manage this risk.

Options recommended for this pest in the *Final pest risk analysis report for Drosophila suzukii* (DAFF Biosecurity 2013) are area freedom, systems approach, or fruit treatment known to be effective against all life stages of *D. suzukii*.

Area freedom

Area freedom is a measure that might be applied to manage the risk posed by *D. suzukii*. The requirements for establishing pest free areas or pest free places of production are set out in

ISPM 4: *Requirements for the establishment of pest free areas* (FAO 1995) and ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 1999).

Drosophila suzukii is considered to be widespread in Japan (Kanzawa 1935); therefore, area freedom may not be a viable option for Japan.

If area freedom from *D. suzukii* could be demonstrated for any areas in Japan, the likelihood of importation of this pest with table grapes sourced from those areas would be reduced to at least 'extremely low'. The restricted risk would then be reduced to at least 'very low', which would achieve Australia's ALOP.

Systems approach

A systems approach that uses the integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the required level of phytosanitary protection could be used to reduce the risk of *D. suzukii* being imported to Australia with consignments of table grapes. More information on a systems approach is set out in ISPM 14: *The use of integrated measures in a systems approach for pest risk management* (FAO 2002).

The Australian Department of Agriculture considers a systems approach to address the risks posed by *D. suzukii* on table grapes may be feasible. The approach could be based on a combination of fruit protection for example fruit bagging, vineyard preventative measures and monitoring, and pest control with post-harvest measures. The approach could be used to progressively reduce the risk of infested fruit being imported to Australia with consignments of table grapes.

Should Japan wish to use a systems approach as a measure to manage the risk posed by *D. suzukii*, MAFF would need to submit to Australia a proposal outlining components of the system and how these components will address the risks posed by this pest. The Australian Department of Agriculture will consider the effectiveness of any system proposed by MAFF.

Treatment of fruit

A treatment that is known to be effective against all life stages of *D. suzukii* is a measure that might be applied to manage the risk posed by this pest in imports of host fruits. Treatment of fruit, with suitable efficacy, would reduce the likelihood of importation of infested fruit to at least 'extremely low'. The restricted risk would then be reduced to at least 'very low', which would achieve Australia's ALOP.

Treatments of fruit will need to be applied offshore to ensure that any live adult flies in consignments of fruit do not enter Australia.

Treatment options that might be applied to manage the risk posed by *D. suzukii* in imports of table grapes include:

Methyl bromide fumigation

Preliminary methyl bromide fumigation trials have shown 100 per cent mortality on all life stages. Methyl bromide fumigation of exported fruit might be used as a stand-alone treatment to achieve Australia's ALOP. However, before methyl bromide could be recommended as a permanent phytosanitary measure for *D. suzukii* in table grapes, a complete efficacy treatment proposal by a proponent country would need to be reviewed and accepted by the Australian Department of Agriculture.

Combined SO_2/CO_2 fumigation followed by cold disinfestation treatment

The Australian Department of Agriculture reviewed the efficacy data in support of a combination treatment of SO_2/CO_2 fumigation followed by a cold disinfestation treatment (listed below), and considered it suitable to manage the risk of *D. suzukii* in table grapes (*Vitis vinifera*).

- 6 per cent carbon dioxide (CO_2) and 1 per cent sulfur dioxide (SO_2) by volume for 30 minutes, at a pulp temperature of 15.6 °C or greater, followed by;
- cold treatment for six days or more at a pulp temperature of –0.5 °C ± 0.5 °C.

OR

- 6 per cent carbon dioxide (CO_2) and 1 per cent sulfur dioxide (SO_2) by volume for 30 minutes, at a pulp temperature of 15.6 °C or greater, followed by;
- cold treatment for twelve days or more at a pulp temperature of 9 °C ± 0.5 °C.

Additional post-treatment security measures may be required to limit post-treatment contamination by flies that are attracted to ripe fruit.

Alternate treatments

Other treatments, demonstrated to be effective against all life stages of *D. suzukii* for table grapes, will be considered by the Australian Department of Agriculture if proposed by MAFF.

Management for *Daktulosphaira vitifoliae*

Daktulosphaira vitifoliae (grape phylloxera) was assessed to have an unrestricted risk estimate that exceeds Australia's ALOP. Measures are required to manage this risk.

Options recommended for this pest are area freedom or fruit treatment known to be effective against all life stages of *D. vitifoliae* such as sulphur pad treatment.

Area freedom

Area freedom is a measure that might be applied to manage the risk posed by *D. vitifoliae*. The requirements for establishing pest free areas or pest free places of production are set out in ISPM 4: *Requirements for the establishment of pest free areas* (FAO 1995) and ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 1999).

Daktulosphaira vitifoliae is present on Honshu Island where a number of major table grape producing prefectures are located; therefore, area freedom may not be a viable option.

If area freedom from *D. vitifoliae* could be demonstrated for any areas in Japan, the likelihood of importation of this pest with table grapes sourced from those areas would be reduced to at least 'extremely low'. The restricted risk would then be reduced to 'negligible', which would achieve Australia's ALOP.

Treatment of fruit

Treatment that is known to be effective against all life stages of *D. vitifoliae* is a measure that might be applied to manage the risk posed by *D. vitifoliae* with table grapes sourced from areas infested or affected by this pest.

Treatment options that might be applied to manage the risk posed by *D. vitifoliae* in imports of table grapes include:

Sulphur pads

Commercial sulphur pads with proven efficacy against *D. vitifoliae* packed inside the plastic liner in all cartons of table grapes for export could be used to manage the risk posed by this pest. The sulphur pads must be a registered product containing a minimum of 970 grams per kilogram anhydrous sodium metabisulphite used at the rate specified on the label (PIRSA 2010).

The inclusion of sulphur pads in all cartons of table grapes for export is to reduce the survival of *D. vitifoliae* associated with packed table grapes and packaging and the likelihood of introduction to at least 'very low'. The restricted risk would then be reduced to at least 'very low', which would achieve Australia's ALOP.

Combined SO_2/CO_2 fumigation

The Australian Department of Agriculture reviewed the efficacy data in support of a combination treatment of SO_2/CO_2 fumigation (listed below), and considered it suitable to manage the risk of *D. vitifoliae*.

- 6 per cent carbon dioxide (CO_2) and 1 per cent sulfur dioxide (SO_2) by volume for 30 minutes, at a pulp temperature of 15.6 °C or greater.

Additional post-treatment security measures may be required to limit post-treatment contamination by this pest.

Treatment of table grapes with combined SO_2/CO_2 fumigation would reduce the likelihood of introduction of infested fruit to at least 'extremely low'. The restricted risk would then be reduced to at least 'negligible', which would achieve Australia's ALOP.

Alternate treatments

Other treatments, demonstrated to be effective against all life stages of *D. vitifoliae*, will be considered by the Australian Department of Agriculture if proposed by MAFF.

Management for *Guignardia bidwellii, Physalospora baccae, Monilinia fructigena, Monilia polystroma* and *Phakopsora euvitis*

Guignardia bidwellii (black rot), *Physalospora baccae* (grape cluster black rot), *Monilinia fructigena* (brown rot), *Monilia polystroma* (Asiatic brown rot) and *Phakopsora euvitis* (grape rust fungus) were assessed to have an unrestricted risk estimate that exceeds Australia's ALOP. Measures are required to manage these risks.

Options recommended for these pathogens are area freedom or a systems approach.

Area freedom

Area freedom is a measure that might be applied to manage the risk posed by these pathogens. The requirements for establishing pest free areas or pest free places of production are set out in ISPM 4: *Requirements for the establishment of pest free areas* (FAO 1995) and ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 1999).

If area freedom from these pathogens could be demonstrated for any areas in Japan, the likelihood of importation of these pathogens with table grapes sourced from those areas would be reduced to at least ‘extremely low’. The restricted risk would then be reduced to at least ‘very low’, which would achieve Australia’s ALOP.

Systems approach

A systems approach that uses the integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the required level of phytosanitary protection could be used to reduce the risk of these pathogens being imported to Australia with consignments of table grapes. More information on a systems approach is set out in ISPM 14: *The use of integrated measures in a systems approach for pest risk management* (FAO 2002).

The existing policy recommends a systems approach as a measure that might be applied to manage the risk posed by *Monilinia fructigena* and *Phakopsora euvitis* with table grapes sourced from areas that are infested or affected by these pathogens. The existing policy considers that a systems approach consisting of vineyard monitoring and control, fruit bagging and visual inspection and remedial action would reduce the likelihood of importation for these pathogens to at least ‘very low’. The restricted risk would then be reduced to at least ‘very low’, which would achieve Australia’s ALOP.

The existing policy does not recommend a systems approach as a measure that might be applied to manage the risk posed by *Guignardia bidwellii* or *Physalospora baccae* with table grapes sourced from areas that are infested or affected by these pathogens. However, the Australian Department of Agriculture is reviewing the existing policy for these pathogens and considers that a systems approach to address the risks posed by these pathogens may be feasible. The approach could be based on area of low pest prevalence, a combination of fruit protection for example fruit bagging, vineyard preventative measures and monitoring, and pest control with post-harvest measures. The approach could be used to progressively reduce the risk of infested table grapes being imported to Australia.

Should Japan wish to use a systems approach as a measure to manage the risk posed by these pathogens, MAFF would need to submit a proposal outlining components of the system and how these components will address the risks posed by these pathogens. The Australian Department of Agriculture will consider the effectiveness of any system proposed by MAFF.

5.1.2 Consideration of alternative measures

Consistent with the principle of equivalence detailed in ISPM 11: *Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms* (FAO 2013), the Australian Department of Agriculture will consider any alternative measures proposed by MAFF, providing that it achieves an equivalent level of quarantine protection.

Evaluation of such measures or treatments will require a technical submission from MAFF that details the proposed measures or treatments, including data from suitable trials to demonstrate efficacy.

5.2 Operational system for the maintenance and verification of phytosanitary status

A system of operational procedures is necessary to maintain and verify the phytosanitary status of table grapes from Japan. This is to ensure that the proposed risk management measures have been met and are maintained.

Details of the operational system, or equivalent, will be determined by agreement between the Australian Department of Agriculture and MAFF before the commencement of trade.

5.2.1 Provision for traceability

Registration of export vineyards

The objective of this recommended procedure is to ensure that:

- table grapes are sourced only from MAFF-registered export vineyards producing export quality fruit, as the pest risk assessments are based on existing commercial production practices
- export vineyards from which table grapes are sourced can be identified so investigation and corrective action can be targeted rather than applying it to all contributing export vineyards in the event that live pests are intercepted.

It is recommended that all export vineyards supplying table grapes for export to Australia are registered with MAFF at the start of each table grape growing season. MAFF would be responsible for ensuring that export table grape growers are aware of pests of quarantine concern to Australia, vineyard monitoring and control measures. The hygiene of export vineyards must be maintained. Registered vineyards would be required to keep records of control measures for auditing purposes. The records of the pest control program would need to be made available to the Australian Department of Agriculture, if requested.

Registration of packing houses and treatment facilities and auditing of procedures

The objective of this recommended procedure is to ensure that:

- table grapes are sourced only from MAFF-registered packing houses, processing export quality fruit, as the pest risk assessments are based on existing commercial packing house activities
- reference to the packing house and the vineyard source (by name or a number code) are clearly stated on cartons of table grapes destined for export to Australia for trace back and auditing purposes.

It is recommended that export packing houses and treatment providers (if applicable) are registered with MAFF before the commencement of harvest each season. The list of registered packing houses and treatment providers must be kept by MAFF, and would need to be made available to the Australian Department of Agriculture, if requested.

MAFF would be required to audit the registered providers at the beginning of each export season to ensure that packing houses and treatment facilities are suitably equipped to carry out the specified phytosanitary activities and treatments. Records of MAFF audits would be made available to the Australian Department of Agriculture upon request.

Packing houses will be required to identify individual vineyards with a unique identifying system and identify fruit from individual vineyards by marking cartons or pallets with a unique number or identification provided by MAFF.

Where table grapes undergo fruit treatment prior to export, this process could only be undertaken by the treatment providers that have been registered with and audited by MAFF for the purpose.

MAFF must immediately suspend exports of table grapes to Australia from packing houses/treatment providers found to be non-compliant and must notify the Australian Department of Agriculture of the suspension.

Suspended packing houses/treatment providers may only be reinstated for processing of table grapes for export to Australia when MAFF and the Australian Department of Agriculture are satisfied that non-compliance issues have been adequately addressed.

5.2.2 Packaging and labelling

The objectives of this recommended procedure are to ensure that:

- table grapes proposed for export to Australia and all associated packaging is not contaminated by quarantine pests or regulated articles
    - regulated articles are any items other than table grapes. Regulated articles may include plant, plant product, soil and any other organisms, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved
    - in this report, table grapes is defined as table grape bunches or clusters, which include peduncles, rachises, laterals, pedicels and berries (Pratt 1988), but not other plant parts (section 1.2.2)
- unprocessed packing material (which may vector pests identified as not being on the pathway and pests not known to be associated with table grape bunches) is not imported with the table grapes
- all wood material used in packaging of table grapes complies with the Australian Department of Agriculture conditions
- secure packaging is used during storage and transport to Australia and must meet Australia’s general import conditions for fresh fruits and vegetables, available on the Department of Agriculture website.
- the packaged table grapes are labelled with the vineyard registration number, packing house registration number for the purposes of trace-back
- the phytosanitary status of table grapes must be clearly identified.

5.2.3 Specific conditions for storage and movement

The objectives of this procedure are to ensure that:

- table grapes for export to Australia that have been treated and/or inspected are kept secure and segregated at all times from any fruit for domestic or other markets, untreated/non-pre-inspected product, to prevent mixing or cross-contamination
- the quarantine integrity of the commodity during storage and movement is maintained.

5.2.4 Freedom from trash

All table grapes for export must be free from trash (for example extraneous stem and leaf material, seeds, soil, animal matter/parts or other extraneous material) and foreign matter. Freedom from trash will be confirmed by the inspection procedures. Export lots or consignments found to contain trash and foreign matter should be withdrawn from export unless approved remedial action is available and applied to the export consignments.

5.2.5 Pre-export phytosanitary inspection and certification by MAFF

The objectives of this recommended procedure are to ensure that:

- all consignments have been inspected in accordance with official procedures for all visually detectable quarantine pests and other regulated articles at a standard 600 unit sampling rate per lot, or equivalent, whereby one unit is one bunch of table grapes
- an international phytosanitary certificate (IPC) is issued for each consignment upon completion of pre-export inspection and any treatment to verify that the relevant measures have been undertaken offshore
- each IPC includes:
  - a description of the consignment (including vineyard registration number or reference code and packing house details)

  and

  - an additional declaration '*The fruit in this consignment has been produced in Japan in accordance with the conditions governing entry of fresh table grapes to Australia and inspected and found free of quarantine pests and regulated articles*'.

5.2.6 Verification by the Australian Department of Agriculture

The objectives of this procedure are to ensure that:

- all consignments comply with Australian import requirements
- consignments are as described on the phytosanitary certificate and quarantine integrity has been maintained.

To ensure that phytosanitary status of consignments of table grapes from Japan meet Australia's import conditions, the Australian Department of Agriculture completes a verification inspection of all consignments of table grapes.

The verification inspection will be conducted in accordance with the Australian Department of Agriculture standard inspection protocol for table grapes, using optical enhancement where necessary.

The verification inspection may be undertaken on-arrival into Australia of table grape consignments or may be undertaken in Japan as offshore pre-shipment inspection, as determined by the Australian Department of Agriculture. For example, offshore pre-shipment arrangements may be required during the initial trade to inspect and verify pest freedom prior to export. Subsequently, subject to a review of the trade and agreement by the Australian Department of Agriculture and MAFF, offshore pre-shipment inspection may become optional.

Under offshore pre-shipment inspection arrangements, officers from the Australian Department of Agriculture may be involved in verification of vineyard monitoring and control for pests of quarantine concern to Australia, verification of packing house procedures, fruit treatment(s) and pre-export phytosanitary inspection by MAFF. The officers may also be involved in auditing of other arrangements such as registration procedures, existing commercial practices, traceability and handling of export fruit in a secure manner.

On arrival, the Australian Department of Agriculture also undertakes a documentation compliance examination to verify that the consignment is as described on the phytosanitary certificate and that the required phytosanitary actions have been undertaken and that product security has been maintained.

5.2.7 Remedial action(s) for non-compliance

The objectives of remedial action(s) for non-compliance are to ensure that:

- any quarantine risk is addressed by remedial action, as appropriate
- non-compliance with import requirements is addressed, as appropriate.

Any consignment that fails to meet Australia’s import conditions must be subject to a suitable remedial treatment, if one is available, re-exported from Australia, or destroyed.

Separate to the corrective measures mentioned above, there may be other actions (that is investigation of possible treatment failures or post-treatment security) necessary depending on the specific pest intercepted and the agreed risk management strategy put in place against that pest.

If product repeatedly fails inspection, the Australian Department of Agriculture reserves the right to suspend the export program and conduct an audit of the risk management systems. The program will recommence only when the Australian Department of Agriculture is satisfied that appropriate corrective action has been taken.

5.3 Responsibility of competent authority

The Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan is the designated NPPO under the International Plant Protection Convention (IPPC).

The NPPO's responsibilities include:

- inspecting plants and plant products moving in international trade
- issuing certificates relating to phytosanitary condition and origin of consignments of plants and plant products
- ensuring that all relevant agencies participating in this program meet the recommended service and certification standards and recommended work plan procedures
- ensuring that administrative processes are established to meet the requirements of the program.

5.3.1 Use of accredited personel

Operational components and the development of risk management procedures may be delegated by MAFF to an accredited agent under an agency arrangement as appropriate. This delegation must be approved by the Australian Department of Agriculture. MAFF is responsible for auditing all delegated risk management procedures.

The accrediting authority must provide MAFF with the documented criteria upon which accreditation is based and this must be available for audit by MAFF. The Australian Department of Agriculture will audit the accrediting system before the commencement of trade.

5.4 Uncategorised pests

If an organism, including contaminant pests, that has not been categorised is detected on table grapes either in Japan or on-arrival in Australia, it will require assessment by the Australian Department of Agriculture to determine its quarantine status and whether phytosanitary action is required. Assessment is also required if the detected species was categorised as not likely to be on the import pathway. If the detected species was categorised as on the pathway but assessed as having an unrestricted risk that achieves Australia's ALOP due to the rating for likelihood of importation, then it would require reassessment. The detection of any pests of quarantine concern not already identified in the analysis may result in remedial action and/or temporary suspension of trade while a review is conducted to ensure that existing measures continue to provide the appropriate level of protection for Australia.

5.5 Audit of protocol

Prior to the first season of trade, the Australian Department of Agriculture will audit the implementation of agreed import conditions and phytosanitary measures including registration, operational procedures and treatment providers, where applicable. This may involve representatives from the Australian Department of Agriculture visiting areas in Japan that produce table grapes for export to Australia.

5.6 Review of policy

The Australian Department of Agriculture reserves the right to review the import policy at any time.

MAFF must inform the Australian Department of Agriculture immediately on detection in Japan of any new pests of table grapes that are of potential quarantine concern to Australia or a significant change in the application of existing commercial production practices considered in this report.

As indicated in section 1.2.2, the scope of this risk analysis report covers all commercially produced table grapes from all table grape producing prefectures of Japan. Japan currently does not intend to export table grapes produced from glasshouse/greenhouse systems. Should Japan wish to export table grapes from glasshouse/greenhouse systems in the future, additional information will be required and the likelihood of introduction of some pests may be reviewed.

5.7 Meeting Australia's food standards

Imported food for human consumption must satisfy Australia's food standards. Australian law requires that all food, including imported food, meets the standards set out in the Australia New Zealand Food Standards Code (hereafter referred to as 'the Code'). Food Standards Australia New Zealand (FSANZ) is responsible for developing and maintaining the Code, including Standard 1.4.2, Maximum Residue Limits (MRLs), available on the ComLaw website. The standards apply to all food in Australia, irrespective of whether it is grown domestically or imported.

If a specific chemical is used on imported foods to control pests and diseases, then any resulting residues must not exceed the specific MRLs in Standard 1.4.2 of the Code for that food.

If there is no MRL listed in the Code for a specific food (or a composite, processed food), then there must be no detectable residues in that specific food.

Where an exporting country uses a chemical for which there is no current listed Australian MRL, there are mechanisms to consider establishing an Australian MRL by harmonising with an MRL established by the Codex Alimentarius Commission (Codex) or by a regulatory authority in a recognised jurisdiction. The mechanisms include applications, submissions or consideration as part of a FSANZ proposal to vary the Code. The application process, including the explanation of establishment of MRLs in Australia, is described at the Food Standards Australia New Zealand website.

6 Conclusion

The findings of this final report for the non-regulated analysis of existing policy for table grapes from Japan are based on a comprehensive scientific analysis of relevant literature.

The Australian Department of Agriculture considers that the risk management measures recommended in this report will provide an appropriate level of protection against the pests identified as associated with the trade of table grapes from Japan.

Appendix A Initiation and categorisation for pests of table grapes from Japan

The steps in the initiation and categorisation processes are considered sequentially, with the assessment terminating at 'Yes' for column 3 (except for pests that are present but under official control and/or pests of regional concern), or the first 'No' for columns 4, 5 or 6.

Details of the method used in this report are given in Section 2: Method for pest risk analysis.

[EP] Species has been assessed previously and import policy already exists.

Note: This pest categorisation table does not represent a comprehensive list of all the pests associated with the entire plant of an imported commodity. Reference to soilborne nematodes, soiborne pathogens, wood borer pests, root pests or pathogens, and secondary pests have not been listed or have been deleted from the table, as they are not directly related to the export pathway of fresh table grapes and would be addressed by Australia's current approach to contaminating pests.

Synonyms are provided when the current scientific name differs from that provided by MAFF or when literature supporting pest categorisation is found under a different scientific name.

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
ARTHROPODS						
Coleoptera						
Acrothinium gaschkevitschii (Motschulsky, 1860) [Chrysomelidae] Shining leaf beetle	Yes (JSAE 1987; MAFF 2008a)	No records found	No This species feeds on buds, leaves and flowers (USDA-APHIS 2002; Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Adoretus sinicus Burmeister, 1855 Synonym: *Adoretus tenuimaculatus* Waterhouse, 1875 [Scarabaeidae] Chinese rose beetle	Yes (JSAE 1987; MAFF 1990a; Furuno 1993)	No records found	No *Adoretus sinicus* larvae feed on roots and adults feed on leaves (Lee *et al.* 2002). This species is not associated with grape bunches (USDA-APHIS 2002).	Assessment not required	Assessment not required	No
Agrilus marginicollis Saunders, 1873 [Buprestidae] Flatheaded grape borer	Yes (JSAE 1987)	No records found	No Though this species attacks grapevine (JSAE 1987), beetles of this genus are wood-borers or occasionally feed on leaves (MAFF 1990a; CABI 2012). No records have been found which associate this species with grape bunches .	Assessment not required	Assessment not required	No

Pest	**Present in Japan**	**Present within Australia**	**Potential to be on pathway**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
Ambrosiodmus apicalis (Blandford, 1894) Synonym: *Xyleborus apicalis* Blandford, 1894 [Scolytidae] Apple ambrosia beetle	Yes (JSAE 1987)	No records found	No Though this species attacks grapevine (JSAE 1987), ambrosia beetles are wood borers (Wood 1982; Coyle *et al.* 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Ambrosiodmus rubricollis (Eichhoff,1875) Synonym: *Xyleborus rubricollis* Eichhoff, 1875 [Scolytidae] Black twig borer	Yes (Tadauchi and Inoue 2006)	Yes Introduced to Australia, no further details (Rabaglia *et al.* 2006) No records found for WA	No Though this species attacks grapevine (USDA-APHIS 2002), it is a wood borer found in branches with a diameter of three to five centimetres (Wood 1982). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Anomala albopilosa albopilosa Hope, 1839 [Scarabaeidae] Cane white grub	Yes (MAFF 2003)	No records found	No This species feeds only on leaves (Hiramatsu *et al.* 2001).	Assessment not required	Assessment not required	No
Anomala cuprea (Hope, 1839) [Scarabaeidae] Cupreous chafer	Yes (JSAE 1987; MAFF 1990a; Tayutivutikul and Kusigemati 1992; MAFF 2008a)	No records found	No This species feeds on leaves and roots (USDA-APHIS 2002; NPQS 2010). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Anomala geniculata Motschulsky, 1866 [Scarabaeidae] Smaller cherry chafer	Yes (JSAE 1987)	No records found	No This species feeds on leaves and roots (USDA-APHIS 2002).(NPQS 2010). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Anomala japonica Arrow, 1913 [Scarabaeidae]	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds on leaves and roots (USDA-APHIS 2002; NPQS 2010). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Anomala octiescostata Burmeister, 1844 [Scarabaeidae]	Yes (JSAE 1987)	No records found	No This species feeds on leaves and roots (USDA-APHIS 2002; NPQS 2010). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Anomala rufocuprea Motschulsky, 1860 [Scarabaeidae] Soybean beetle	Yes (JSAE 1987; Yokoyama *et al.* 1998; MAFF 2008a)	No records found	No *Anomala rufocuprea* larvae feed on roots (Yokoyama *et al.* 1998) and adults feed on leaves (Hiramatsu *et al.* 2001). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Anoplophora glabripennis (Motschulsky, 1853) Synonym: *Anoplophora angustatus* (Pic., 1925) [Cerambycidae] Asian longhorned beetle	Yes (Zhang *et al.* 2002)	No records found	No This species feeds and oviposits on bark (Zhang *et al.* 2002; Haack *et al.* 2006). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Apoderus jekeli Roelofs, 1874. [Attelabidae] Chestnut leaf-cut weevil	Yes (JSAE 1987)	No records found	No This species feeds on leaves (NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Aulacophora femoralis (Motschulsky, 1857) Synonym: *Aulacophora chinensis* Weise, 1923 [Chrysomelidae] Orange brown galerucid	Yes (JSAE 1987; Whalon *et al.* 2003)	No records found	No *Aulacophora femoralis* adults feed on leaves while larvae feed on roots (Li 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Baris deplanata Roelofs, 1875 [Curculionidae] Small mulberry weevil	Yes (JSAE 1987; MAFF 1989b)	No records found	No While this species attacks grapevine (JSAE 1987; MAFF 1989b), larvae of this genus bore into roots or stems of hosts (Bailey *et al.* 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Baris melancholica Roelofs, 1875 Synonym: *Paracythopeus melancholicus* (Roelofs, 1875) [Curculionidae]	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987), larvae of this genus bore into roots or stems of hosts (Bailey *et al.* 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Basilepta fulvipes (Motschulsky, 1860) [Chrysomelidae] Golden green minute leaf beetle	Yes (JSAE 1987)	No records found	No This species feeds only on leaves (USDA-APHIS 2002; NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Blitopertha orientalis (Waterhouse, 1875) Synonym: *Anomala orientalis* Waterhouse, 1875 [Scarabaeidae] Asiatic beetle	Yes (Togashi 1980)	No records found	No This species feeds on leaves and roots (USDA-APHIS 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Brachyclytus singularis Kraatz, 1879 [Cerambycidae] Redshouldered tiger longicorn beetle	Yes (JSAE 1987)	No records found	No This species feeds on stems of grapevine (USDA-APHIS 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Bromius obscurus (Linnaeus, 1758) [Chrysomelidae] Western grape rootworm	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds on leaves, shoots and young fruit of grapevine (Zhang 2005), but drops from the plant if disturbed (USDA-APHIS 2002). It is therefore not associated with grape bunchesat harvest.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Byctiscus lacunipennis (Jekel, 1860) Synonym: *Aspidobyctiscus lacunipennis* (Jekel, 1860) [Rhynchitidae] Grape leaf roller weevil	Yes (JSAE 1987; Sawada 2000; Tadauchi and Inoue 2006)	No records found	No This species feeds only on leaves of grapevine (USDA-APHIS 2002; Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Carpophilus hemipterus (Linnaeus, 1785) [Nitidulidae] Dried fruit beetle	Yes (JSAE 1987)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Carpophilus humeralis (Fabricius, 1781) [Nitidulidae] Pineapple sap beetle	Yes (Hayashi 1978)	Yes NT, WA (Plant Health Australia 2001a) Qld, Vic (James *et al.* 1995) WA, NSW, SA (James *et al.* 2000)	Assessment not required	Assessment not required	Assessment not required	No
Ceresium sinicum White, 1855 [Cerambycidae] Longhorn beetle	Yes (JSAE 1987)	No records found	No The larvae of this species bore into the woody parts of grapevine (Luo *et al.* 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Chlorophorus annularis (Fabricius, 1787) [Cerambycidae] Bamboo tiger longicorn	Yes (JSAE 1987; Sawada 2000; MAFF 2003)	Yes NSW, Qld, Vic (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No The larvae of this species attack roots while adults feed on flowers (Walker 2008a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Dryocoetiops coffeae (Eggers, 1923) Synonym: *Taphrorychus coffeae* (Eggers 1923) [Curculionidae: Scolytinae] Bark beetle	Yes (Tadauchi and Inoue 2006)	No records found	No Scolytine beetles are associated with woody plant parts (Luo *et al.* 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Exomala orientalis (Waterhouse, 1875) Synonym: *Blitopertha orientalis* [Scarabaeidae] Oriental beetle	Yes (JSAE 1987)	No records found	No This species feeds only on leaves of grapevine (NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Fleutiauxia armata (Baly, 1874) Synonym: *Phyllobrotica armata* Baly 1874 [Chrysomelidae] Mulberry leaf beetle	Yes (JSAE 1987; Tadauchi and Inoue 2006)	No records found	No The larvae of this species hibernate and pupate in the soil (Guo-liang 1993). Adults feed only on leaves and feign death if disturbed (Guo-liang 1993). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Gametis jucunda (Faldermann, 1835) Synonym: *Oxycetonia jucunda* (Faldermann, 1835) [Scarabaeidae] Citrus flower chafer	Yes (JSAE 1987; Ijima and Tamura 2001)	No records found	No *Gametis jucunda* adults feed on flowers, leaves and stems and larvae attack roots (MAFF 1990a; Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Glycyphana fulvistemma Motschulsky, 1858 [Scarabaeidae] Black flower chafer	Yes (JSAE 1987; MAFF 1990a)	No records found	No This species feeds only on flowers and leaves (USDA-APHIS 2002; NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Harmonia axyridis (Pallas, 1773) [Coccinellidae] Harlequin ladybird	Yes (Tadauchi and Inoue 2006; Brown *et al.* 2008b) There are no records of this species attacking grapevines in Japan. This species is, however, known to attack grapevines as well as other fruit crops in for example the US (Missouri State University 2005; Kenis *et al.* 2008).	No (Walker 2008b)	Yes This species is recorded feeding on grape berries in the US (Missouri State University 2005; Kenis *et al.* 2008). *Harmonia axyridis* aggregates within grape clusters to feed on damaged berries (Kovach 2004; Galvan *et al.* 2006). In a laboratory test, this species was found able to feed on undamaged grapes, but still prefers to feed on damaged grapes (Kovach 2004).	Yes *Harmonia axyridis* was introduced as a biological control agent of aphids and coccids in Europe, North America, Africa and South America (Koch *et al.* 2006; Brown *et al.* 2008b). *Harmonia axyridis* has a wide host range (that is multiple prey species), ability to establish and disperse, indirect and direct effects on non-target species. In Europe, *H. axyridis* is considered to be an invasive alien species (Brown *et al.* 2008b). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *H. axyridis* has the potential to establish and spread in Australia.	Yes *Harmonia axyridis* are a concern of the wine industry. Due to their noxious odor, even small numbers of beetles inadvertently processed along with grapes can taint the flavor of wine. Tainted wine has reportedly resulted in millions of dollars in losses to the wine industry throughout eastern USA and southern Canada (Potter *et al.* 2005; Galvan *et al.* 2006). Recent studies suggest that infestations can cause allergies in some individuals, ranging from eye irritation to asthma which may incur medical costs. *Harmonia axyridis* has also invaded buildings, incurring cleanup and pest control costs (Potter *et al.* 2005).	Yes[EP]
Hayashiclytus acutivittis (Kraatz, 1879) Synonym: *Rhaphuma acutivittis* Kraatz, 1879 [Cerambycidae]	Yes (Tadauchi and Inoue 2006)	No records found	No While this species attacks grapevine (Zhang 2005), larvae feed internally on woody material (CSIRO 1970; CSIRO 1991).	Assessment not required	Assessment not required	No
Holotrichia diomphalia (Bates, 1888) [Scarabaeidae] Northeastern larger black chafer	Yes (Tadauchi and Inoue 2006)	No records found	No Larvae attack roots while adults feed on shoots, young leaves and flowers (Chuno *et al.* 1960; AQSIQ 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Hoplia communis Waterhouse, 1875 [Scarabaeidae] Long-legged chafer	Yes (JSAE 1987)	No records found	No Adults occasionally feed on grape berries (Molinar and Norton 2003) but drop from the plant if disturbed (Flaherty *et al.* 1992a).	Assessment not required	Assessment not required	No
Hypothenemus eruditus Westwood, 1836 [Scolytidae] Bark beetle	Yes (Tadauchi and Inoue 2006)	Yes NSW, Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No Scolytine beetles are associated with woody plant parts (Luo *et al.* 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Lema decempunctata Gebler, 1830 [Chrysomelidae] Ten-spotted lema	Yes (Sawada 2000; Tadauchi and Inoue 2006)	No records found	No This species feeds on leaves (NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Maladera orientalis (Motschulsky, 1857) As *Serica orientalis* Motschulsky, 1857 in (Zhang 2005) [Scarabaeidae] Smaller velvety chafer	Yes (JSAE 1987; MAFF 1990a)	No records found	No This species only feeds on leaves and roots (MAFF 1990a; Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Melanotus erythropygus Candeze, 1873 [Elateridae]	Yes (JSAE 1987)	No records found	No This species feeds on roots of its host (USDA-APHIS 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Nodina chalcosoma Baly, 1874 [Chrysomelidae] Leaf beetle	Yes (JSAE 1987; Tadauchi and Inoue 2006)	No records found	No Chysomelid beetles feed only on leaves of their hosts (Beenen and Roques 2010). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Otiorhynchus sulcatus (Fabricius, 1775) [Curculionidae] Black vine weevil	Yes (JSAE 1987; Tadauchi and Inoue 2006)	Yes NSW, SA, Tas, Vic (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No Adults of this species feed on buds, leaves and flowers but only at night and larvae attack roots (Bentley *et al.* 2009). Adults hide in the soil during the day (Moorhouse *et al.* 1992).	Assessment not required	Assessment not required	No
Paropsides duodecimpustulata (Gebler, 1825) [Chrysomelidae]	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds only on leaves (USDA-APHIS 2002; NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Phyllopertha diversa Waterhouse, 1875 [Scarabaeidae] Pale-brown chafer	Yes (JSAE 1987)	No records found	No This species feeds only on leaves (USDA-APHIS 2002; NPQS 2007a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Phymatodes albicinctus Bates, 1873 [Cerambycidae] Whitebanded longicorn beetle	Yes (JSAE 1987)	No records found	No Larvae of this species feed internally on the woody parts (Luo *et al.* 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Phymatodes maaki (Kraatz, 1879) [Cerambycidae] Redshouldered longicorn beetle	Yes (JSAE 1987)	No records found	No This species feeds only on stems (USDA-APHIS 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Popillia japonica Newman, 1838 [Scarabaeidae] Japanese beetle	Yes (JSAE 1987; Tayutivutikul and Kusigemati 1992)	No records found	Yes *Popillia japonica* is recorded to feed on the foliage and fruit of grapes (Pfeiffer and Schultz 1986a; Tayutivutikul and Kusigemati 1992).	Yes *Popillia japonica* has been accidentally introduced into the USA where it is now widespread (Fleming 1972). The ability of *P. japonica* larvae to feed on grass roots while the adults feed on foliage and fruit (Pfeiffer and Schultz 1986a) makes it ideally suited to exploiting Australian urban and agricultural areas, especially home gardens with lawns.	Yes *Popillia japonica* inflicts millions of dollars damage through lost production and control costs to the USA each year (Reding and Krause 2005). Agricultural crops damaged by *P. japonica* include apples (*Malus* spp.), stonefruits (*Prunus* spp.), berries (*Rubus* spp.) and grapes (*Vitis* spp.)	Yes[EP]
Protaetia brevitarsis Lewis, 1879 [Scarabaeidae] Flower beetle	Yes (JSAE 1987; MAFF 2003)	No records found	No Adults feed externally on fruit and would not remain with grape bunches if disturbed (Zhang 2005).	Assessment not required	Assessment not required	No
Scelodonta lewisi Baly, 1874 [Chrysomelidae]	Yes (JSAE 1987)	No records found	No Larvae of this species live in the soil and feed on roots (Li 2004).	Assessment not required	Assessment not required	No
Scolytus japonicus Chapuis, 1875 [Scolytidae] Japanese bark beetle	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987), beetles of this genus burrow into bark and wood of their hosts (Wood 1982; Batta 2007). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Sinoxylon japonicum Lesne, 1895 [Bostrichidae] Powderpost beetle	Yes (JSAE 1987)	No records found	No While this species does attack grapevine (JSAE 1987), Bostrichid beetles are wood-boring specialists (Lawrence and Britton 1994).	Assessment not required	Assessment not required	No
Stenygrinum quadrinotatum Bates, 1873 [Cerambycidae] Longhorn beetle	Yes (Tadauchi and Inoue 2006)	No records found	No Larvae bore into woody parts of grapevine (Luo *et al.* 2005).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Xylopsocus capucinus (Fabricius, 1781) [Bostrichidae] False powderpost beetle	Yes (Tadauchi and Inoue 2006)	Yes NSW, NT, Qld (Plant Health Australia 2001a) Not known to be present in WA.	No Larvae feed on roots and adults bore into stems (Woodruff *et al.* 2011).	Assessment not required	Assessment not required	No
Xylosandrus germanus (Blandford, 1894) [Scolytidae] Alnus ambrosia beetle	Yes (JSAE 1987; MAFF 1990a)	No records found	No This species feeds on stems and trunks and usually attacks dying or cut material (MAFF 1990a; Rabaglia *et al.* 2006).	Assessment not required	Assessment not required	No
Xylothrips flavipes (Illiger, 1801) [Bostrichidae] Auger beetle	Yes (Tadauchi and Inoue 2006)	Yes NSW, NT, Qld, Vic (Plant Health Australia 2001a) Not known to be present in WA.	No Both adults and larvae bore into the woody parts of the vine (Walker 2011).	Assessment not required	Assessment not required	No
Xylotrechus pyrrhoderus Bates, 1873 [Cerambycidae] Grape borer	Yes (JSAE 1987; MAFF 2008a)	No records found	No Larvae of this species bore into roots and branches (Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Diptera						
Bactrocera dorsalis (Hendel, 1912) Synonym: *Dacus dorsalis* (Hendel, 1912) [Tephritidae] Oriental fruit fly	No This species was present in Japan, but was eradicated in 1986 (Nakamori *et al.* 1988)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Cecidomyia japonica Nijveldt, 1987 [Cecidomyiidae] Gall midge	Yes (Tadauchi and Inoue 2006)	No records found	No *Cecidomyia* midges form galls on grapevine leaves (Paik *et al.* 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Cecidomyia viticola Osten Sacken, 1862 [Cecidomyiidae] Grape tube gallmaker	Yes (Tadauchi and Inoue 2006)	No records found	No This species forms galls on grapevine leaves (Paik *et al.* 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Drosophila simulans Sturtevant 1919 [Drosophilidae] Vinegar fly	Yes (Mito and Uesugi 2004; Tadauchi and Inoue 2006)	Yes Vic, WA (Plant Health Australia 2001a) NSW, Qld, WA (Evenhuis 2007)	Assessment not required	Assessment not required	Assessment not required	No

Pest	**Present in Japan**	**Present within Australia**	**Potential to be on pathway**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
Drosophila suzukii (Matsumura, 1931) [Drosophilidae] Spotted wing drosophila	Yes (Kanzawa 1936; JSAE 1987)	No records found	Yes This species lays eggs into grape berries (USDA-APHIS 2002). This species has been recorded from both table grapes and wine grapes (Kanzawa 1936; Walsh *et al.* 2011).	Yes *Drosophila suzukii* attacks the fruit of a broad range of commercially grown commodities, including strawberry, apple, pear, grape and stone fruit (CABI 2012). These hosts are available in Australia. This species is distributed across Asia, Europe and the Americas (CABI 2012). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *D. suzukii* has the potential to establish and spread in Australia.	Yes This species can cause significant economic damage to caneberries, cherries, grapes, strawberries, blueberries, and stone fruit (CABI 2012).	No Pest risk assessment for *D. suzukii* will not be conducted in this risk analysis report for table grapes from Japan. There is existing policy for *D. suzukii* for table grapes from all countries. A summary of pest information and previous assessment is presented in Chapter 4 of this report. Further information on existing policy can be found in the 'Final pest risk analysis report for *Drosophila suzukii*', published on 24 April 2013 (DAFF Biosecurity 2013).

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Hemiptera						
Aleurocanthus spiniferus (Quaintance, 1903) [Aleyrodidae] Citrus spiny whitefly	Yes (JSAE 1987; MAFF 1990a)	Yes NT, Qld (Plant Health Australia 2001a) No records found for WA	No While this species attacks grapevine (JSAE 1987; MAFF 1989b), it feeds on the underside of leaves (Muniappan *et al.* 2006) and is not considered to be associated with grape bunches (USDA-APHIS 2002).	Assessment not required	Assessment not required	No
Aleurolobus taonabae (Kuwana, 1911) As *Aleyrodes taonaboe* Kuwana in (Li 2004) [Aleyrodidae] Grape whitefly	Yes (JSAE 1987; Dubey and Ko 2009)	No records found	Yes This species feeds on grape (JSAE 1987) attacking both leaves and mature berries (Li 2004).	Yes Hosts, *Vitis spp.* are available in Australia. Several of Australia's major whitefly pests including the glasshouse whitefly (*Trialeurodes vaporianum*) are introduced species native to the palaearctic region. This species is distributed across India, China, Taiwan and Japan (Dubey and Ko 2009). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *A. taonabae* has the potential to establish and spread in Australia.	Yes *Aleurolobus taonabae* feeds on leaves and fruits, reducing crop yield and quality. When populations are high, honeydew produced by their feeding activities may promote the growth of sooty moulds, which reduce fruit marketability (Pfeiffer and Schultz 1986b; Blodgett 1992).	Yes[EP]
Aonidiella citrina (Coquillett, 1891) [Diaspididae] Yellow scale	Yes (MAFF 1990a; Mito and Uesugi 2004; Ben-Dov 2012b)	Yes NSW, SA, Vic (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Aonidiella orientalis (Newstead, 1894) [Diaspididae] Oriental yellow scale	Yes (Mito and Uesugi 2004; Inoue *et al.* 2006)	Yes NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aphis fabae Scopoli, 1763 [Aphididae] Black aphid	Yes (Tadauchi and Inoue 2006; Sugimoto 2008)	No records found	No While this species attacks grapevine (USDA-APHIS 2002), it rests and feeds on leaves (Miles 1987) and is not associated with grape bunches (Ingels *et al.* 1998).	Assessment not required	Assessment not required	No
Aphis gossypii Glover, 1877 [Aphididae] Cotton aphid	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Aphis spiraecola (Patch, 1914) Synonym: *Aphis citricola* van der Goot, 1912 [Aphididae] Spiraea aphid	Yes (MAFF 1990a; Tadauchi and Inoue 2006)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Aphrophora vitis Matsumura, 1904 Synonym: Dophoara vitis (Matsumura, 1904) [Aphrophoridae] Grape spittlebug	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987), spittlebug nymphs feed on sap from young shoots and adults leave the host when disturbed (Liang and Fletcher 2003). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Apolygus lucorum (Meyer-Dür, 1843) Synonym: *Lygocoris lucorum* Meyer Dũr, 1843 [Miridae] Small green plant bug	Yes (JSAE 1987)	No records found	No Both adults and nymphs suck sap from leaves, flowers and young shoots (Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Apolygus spinolai (Meyer-Dur, 1841) Synonym: *Lygocoris spinolai* (Meyer-Dur, 1841) [Miridae] Green grape capsid	Yes (JSAE 1987)	No records found	No Nymphs and adults feeds on leaves, flowers and developing fruit of grapevine, but are not associated with mature grape bunches (Kim *et al.* 2000).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Arboridia apicalis (Nawa, 1913) Synonym: *Zygina apicalis* Nawa, 1913; *Erythroneura apicalis* Nawa, 1913 (also refer to *Erythroneura* sp.) [Cicadellidae] Grape leafhopper	Yes (JSAE 1987; MAFF 2008a)	No records found	No This species feeds only on leaves (Li 2004).	Assessment not required	Assessment not required	No
Arboridia kakogawana (Matsumura, 1932) [Cicadellidae] Japanese grape cycad	Yes (Tadauchi and Inoue 2006)	No records found	No This species is only associated with leaves (Ahn *et al.* 2005).	Assessment not required	Assessment not required	No
Arboridia suzukii (Matsumura, 1916) [Cicadellidae] Leafhopper	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987), this genus is only associated with leaves (Li 2004; Ahn *et al.* 2005).	Assessment not required	Assessment not required	No
Aspidiotus destructor Signoret, 1869 [Diaspididae] Coconut scale	Yes (Murakami 1970; JSAE 1987; Inoue *et al.* 2006; Ben-Dov 2012b)	Yes NSW, NT, Qld, Vic, WA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Aspidiotus nerii Bouché, 1833 [Diaspididae] Oleander scale	Yes (Inoue *et al.* 2006; Ben-Dov 2012b)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Batracomorphus diminutus (Matsumura, 1912) [Cicadellidae]	Yes (JSAE 1987)	No records found	No This genus is associated only with leaves (USDA-APHIS 2002) and is not considered to be present on the export pathway.	Assessment not required	Assessment not required	No
Batracomorphus mundus (Matsumura, 1912) [Cicadellidae]	Yes (JSAE 1987)	No records found	No This genus is associated only with leaves (USDA-APHIS 2002) and is not considered to be present on the export pathway.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Batracomorphus stigmaticus (Matsumura, 1912) [Cicadellidae]	Yes (JSAE 1987)	No records found	No This genus is associated only with leaves (USDA-APHIS 2002) and is not considered to be present on the export pathway.	Assessment not required	Assessment not required	No
Bothrogonia japonica Ishihara, 1962 [Cicadellidae] Black-tipped leafhopper	Yes (JSAE 1987; MAFF 1990a)	No records found	No This species feeds only on leaves (MAFF 1990b). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Cerococcus muratae (Kuwana, 1907) Synonym: *Asterococcus muratae* (Kuwana, 1907) [Asterolecaniidae]	Yes (JSAE 1987; MAFF 2009)	No records found	No This species feeds only on the bark (Umeya and Okada 2003).	Assessment not required	Assessment not required	No
Chrysomphalus dictyospermi (Morgan, 1889) [Diaspididae] Spanish red scale	Yes (MAFF 1990a; Ben-Dov 2012b)	Yes NSW, NT, Qld, SA (Plant Health Australia 2001a) No records found for WA. However, WA does not require mitigation measures for this pest for other hosts (such as citrus, peach or nectarine fruit) from Australian states where this pest is present (DAFWA 2014).	Assessment not required	Assessment not required	Assessment not required	No
Coccus hesperidum Linnaeus, 1758 [Coccidae] Brown soft scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012a)	Yes ACT, NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Crisicoccus matsumotoi (Siraiwa, 1935) [Pseudococcidae] Matsumoto mealybug	Yes (JSAE 1987; Ben-Dov 2012c)	No records found	Yes This species is a pest of grapevine (JSAE 1987) and is known to be associated with fruit on other hosts (AQIS 1999b).	Yes This species can survive on many types of host plant, including grape (JSAE 1987), pear, citrus and fig (Ben-Dov 2012c). These hosts are available in Australia. *Crisicoccus matsumotoi* has been recorded from Japan, Korea, India and the Philipines (Ben-Dov 2012c). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *C. matsumotoi* has the potential to establish and spread in Australia.	Yes Mealybugs feed on sap, stressing their host plants and reducing yield of commercial crops. Production of honeydew also promotes growth of sooty moulds, which reduce the marketability of fruit (CABI 2009)	Yes[EP]
Daktulosphaira vitifoliae (Fitch, 1855) Synonym: *Viteus vitifolii* (Fitch, 1855) [Phylloxeridae] Grapevine phylloxera	Yes (JSAE 1987; MAFF 2008a)	Yes This pest is only present in isolated areas of NSW and Victoria (Plant Health Australia 2001a) and is under official control (NVHSC 2005; PGIBSA 2009).	Yes This species attacks grapevine (MAFF 2008a) and the first instar nymphs can be found on the leaves and fruit (Buchanan and Whiting 1991).	Yes *Daktulosphaira vitifoliae* is already established in small areas of Australia, where it is under official control (NVHSC 2005; PGIBSA 2009). In Australia, several generations develop in each growing season (NVHSC 2008).	Yes The only reliable control measure for *D. vitifoliae* is the complete removal of infested vines and their replacement with grapevines grown on resistant rootstock (Buchanan and Whiting 1991).	Yes[EP]
Diaspidiotus ancylus (Putnam, 1878) [Diaspididae] Putnam scale	Yes (Ben-Dov 2012b)	Yes NSW, Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No This species is not associated with grape bunches (Ben-Dov 2012b).	Assessment not required	Assessment not required	No
Diaspidiotus perniciosus (Comstock, 1881) Synonym: *Comstockaspis perniciosa* (Comstock, 1881) [Diaspididae] San Jose scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012b)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Dolycoris baccarum (Linnaeus, 1758) [Pentatomidae] Sloe shield bug	Yes (JSAE 1987)	No records found	No Though this species attacks grape berries (Zhang 2005) it will not be transported with grape bunches as it drops off when disturbed (Alcock 1971; AQSIQ 2007a).	Assessment not required	Assessment not required	No
Drosicha howardi (Kuwana, 1922) [Monophlebidae] This species has been moved from the Family Margarodidae to Monophlebidae (Ben-Dov *et al.* 2012).	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2013a)	No records found	No This species feeds only on twigs and branches of its hosts (MAFF 1990a; Qu *et al.* 1996). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Dysmicoccus brevipes (Cockerell, 1893) [Pseudococcidae] Pineapple mealybug	Yes (Mito and Uesugi 2004; Inoue *et al.* 2006; Tadauchi and Inoue 2006; Ben-Dov 2012c)	Yes NSW, NT, Qld, SA, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Empoasca flavescens (Fabricius, 1794) Synonym: *Edwardsiana flavescens* (Fabricius, 1794) [Cicadellidae] Small green leafhopper	Yes (JSAE 1987; MAFF 1989a; MAFF 2010b)	No records found	No While this species attacks grapevine (JSAE 1987), this genus feeds only on leaves and does not remain on the host during harvesting (CABI 2012).	Assessment not required	Assessment not required	No
Empoasca vitis (Göthe, 1875) [Cicadellidae] Vine leafhopper	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds only on the leaves of grapevine (Pavan *et al.* 1998; CABI 2012).	Assessment not required	Assessment not required	No
Eoscarta assimilis (Uhler, 1896) Synonym: *Paracercopis assimilis* (Uhler, 1896) [Cercopidae] Root spittlebug	Yes (JSAE 1987; Umeya and Okada 2003)	No records found	No Adults of this species attack grapevine (JSAE 1987; MAFF 1989b) but rarely infest the fruit (Umeya and Okada 2003). In addition, Cercopidae spittlebugs jump or fly away from the host if disturbed (Sutton and Burrows 2010).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Epiacanthus stramineus (Motschulsky, 1861) [Cicadellidae] Grape leafhopper	Yes (JSAE 1987; MAFF 1990a)	No records found	No This species is associated only with leaves (MAFF 1990a).	Assessment not required	Assessment not required	No
Erthesina fullo (Thunberg, 1783) [Pentatomidae] Yellow-spotted stink bug	Yes (JSAE 1987)	No records found	No Though this species attacks grape berries (Zhang 2005) it will not be transported with grape bunches as it drops off when disturbed (Alcock 1971; AQSIQ 2007a).	Assessment not required	Assessment not required	No
Erythroneura mori (Matsumura, 1906) [Cicadellidae] Leafhopper	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (Li 2004), this genus feeds and oviposit only on leaves (Tan *et al.* 1997; Prischmann *et al.* 2007).	Assessment not required	Assessment not required	No
Eulecanium cerasorum (Cockerell, 1900) Synonym: *Lecanium cerasorum* Cockerell 1900 [Coccidae] Calico scale	Yes (JSAE 1987; MAFF 1989a; Ben-Dov 2012a)	No records found	No This species feeds only on sap from the leaves and bark (Hubbard and Potter 2005).	Assessment not required	Assessment not required	No
Eulecanium giganteum (Shinji, 1935) Synonym: *Lecanium gigantea* Shinji, 1935 [Coccidae]	Yes (Ben-Dov 2012a)	No records found	No This species feeds on twigs, branches and leaves (Yang *et al.* 2008). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Eurhadina pulchella (Fallén, 1806) [Cicadellidae] Leafhopper	Yes (JSAE 1987; Tadauchi and Inoue 2006)	No records found	No While this species attacks grapevine (JSAE 1987), leafhoppers feed on leaves and do not remain with the host when disturbed (Prischmann *et al.* 2007).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Ferrisia virgata Cockerell, 1893 Synonym: [Pseudococcidae] Striped mealy bug	Yes (Inoue *et al.* 2006; Tadauchi and Inoue 2006; Ben-Dov 2012c)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Glaucias subpunctatus Walker, 1867 [Pentatomidae] Polished green stink bug	Yes (MAFF 1989a; MAFF 1990a; MAFF 2008a)	No records found	No While this species attacks grape berries (MAFF 2008a), it drops from the plant if disturbed and will therefore not remain with grape bunches during harvest (Alcock 1971; USDA 2002).	Assessment not required	Assessment not required	No
Halyomorpha halys (Stål, 1855) Synonym: *Halyomorpha mista* (Uhler 1860) [Pentatomidae] Brown marmorated stink bug	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a)	No records found	No This species feeds on the berries (Zhang 2005). However, it drops from the plant when disturbed and will therefore not remain with grape bunches during harvest (Alcock 1971).	Assessment not required	Assessment not required	No
Hemiberlesia lataniae (Signoret, 1869) [Diaspididae] Lantania scale	Yes (JSAE 1987; Ben-Dov 2012b)	Yes NSW, NT, Qld, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Hemiberlesia rapax (Comstock, 1881) [Diaspididae] Greedy scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012b)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Icerya purchasi (Maskell, 1876) [Monophlebidae] Cottony cushion scale	Yes (JSAE 1987; MAFF 1990a; Mito and Uesugi 2004; Ben-Dov 2013a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Icerya seychellarum (Westwood, 1855) [Monophlebidae] Seychelles fluted scale	Yes (JSAE 1987; MAFF 1990a; Mito and Uesugi 2004; Ben-Dov 2013a)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Limassolla multipunctata (Matsumura, 1920) [Cicadellidae] Leafhopper	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987), leafhoppers feed on leaves (Li 2004) and do not remain with the host when disturbed.	Assessment not required	Assessment not required	No
Lycorma delicatula (White, 1845) [Fulgoridae] Planthopper	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds on branches and stems (Li 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Macrosiphum euphorbiae (Thomas, 1878) [Aphididae] Potato aphid	Yes (JSAE 1987; MAFF 2003)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Myzus persicae (Sulzer, 1776) [Aphididae] Green peach aphid	Yes (MAFF 1990b; Tadauchi and Inoue 2006)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001b) *Myzus persicae* can vector *Broad bean wilt virus 2* (Zhou 2002), a potential virus of grapevine (Martelli 1999). Broad bean wilt virus 2 is present in Japan (Kobayashi *et al.* 2004) and is also present in NSW (Schwinghamer *et al*. 2007) and may be present in Qld (Plant Health Australia 2001a), but is not known to occur in WA. Although *M. persicae* is present in Australia, the potential for *M. persicae* carrying *Broad bean wilt virus 2* warrants further assessment for this species.	No Although reported from grapes in spring, *M. persicae* is likely to be present only as transients (Flaherty *et al.* 1992a). Watson (1923) reported *M. persicae* on the leaves and tender stems of grapevine, but did not consider this species to be a berry feeder. *Myzus persicae* has been reported on grapevine flower clusters in California on one occasion (Flaherty *et al.* 1992a). It has not been reported feeding on grape bunches but has been reported on the fruit of other hosts (Gildow *et al.* 2004). Also, *M. persicae* can only vector *Broad bean wilt virus 2* for a maximum of two hours after feeding (Zhou 2002). No records have been found of virus acquisition from infected berries by *M. persicae*.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Nezara antennata Scott, 1874 [Pentatomidae] Green stink bug	Yes (MAFF 1990a; MAFF 2008a)	No records found	No While adults occasionally feed on grape bunches (MAFF 2008a), eggs are not laid on grapevine (Kobayashi 1972). Adults would not remain with grape bunches if disturbed.	Assessment not required	Assessment not required	No
Nezara viridula (Linnaeus, 1758) [Pentatomidae] Southern green stink bug	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Nipaecoccus viridis (Newstead, 1894) Synonym: *Nipaecoccus vastator* (Maskell, 1895) [Pseudococcidae] Spherical mealybug	Yes (MAFF 1990a; Ben-Dov 2012c)	Yes NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Parasaissetia nigra Nietner 1861 [Coccidae] Pomegranate scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012a)	Yes NSW, NT, Qld, SA, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Parthenolecanium corni (Bouché, 1844) Synonym: *Lecanium corni* Bouché 1844 [Coccidae] European fruit lecanium	Yes (JSAE 1987; MAFF 1989a; Ben-Dov 2012a)	Yes Tas, Vic (Plant Health Australia 2001a). Not known to be present in WA (Poole 2010).	Yes This species sucks sap from branches, leaves and fruit of grapevine (Zhang 2005).	Yes *Parthenolecanium corni* is highly polyphagous (Ben-Dov 2012a) and many potential hosts are available in Western Australia. This species has been recorded from Canada, China, France, Greece and parts of Australia (Ben-Dov 2012a). Environments with climates similar to these regions exist in Western Australia, suggesting that *P. corni* has the potential to establish and spread in WA.	Yes Trees infested with *P. lecanium* lose leaves and decrease their annual growth while heavy infestations lead to fungal growth on the honeydew secretions (David'yan 2008). This species also transmits viruses (Ben-Dov 2012a).	Yes (WA)[EP]

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Parthenolecanium persicae (Fabricius, 1776) Synonym: *Lecanium persicae* (Fabricius, 1776) [Coccidae] European peach scale	Yes (JSAE 1987; Ben-Dov 2012a)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Phenococcus hirsutus (Green, 1908) Synonym: *Maconellicoccus hirsutus* (Green, 1908) [Pseudococidae] Pink hibiscus mealybug	Yes (Tadauchi and Inoue 2006; Ben-Dov 2012c)	Yes NT, Qld, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Philaenus spumarius Linnaeus1758 [Cercopidae] Meadow froghopper	Yes (JSAE 1987)	No There is one record from1996 in Qld but this was an international interception (Plant Health Australia 2001a). It is accepted that this species is not present in Australia (Fletcher 2000; CABI 2012).	No While this species attacks grapevine (Bournier 1977), it feeds from stem of hosts (Crews *et al.* 1998). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Pinnaspis strachani (Cooley, 1899) [Diaspididae] Hibiscus snow scale	Yes (Takagi 1963; MAF Biosecurity New Zealand 2000; Ben-Dov 2012b)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a) SA, WA (Brookes 1964)	Assessment not required	Assessment not required	Assessment not required	No
Planococcus citri (Risso, 1813) [Pseudococccidae] Citrus mealybug	Yes (JSAE 1987; Ben-Dov 2012c)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Planococcus kraunhiae (Kuwana, 1902) [Pseudococcidae] Japanese mealybug	Yes (JSAE 1987; Ben-Dov 2012c)	No records found	Yes This species feeds on the leaves, branches and fruit of grapevine (JSAE 1987; NPQS 2007a).	Yes *Planococcus kraunhiae* is a pest of citrus, persimmon, fig, coffee (Ben-Dov 1994) and grape (JSAE 1987), all of which are grown commercially in Australia. This species is found in California, Taiwan, China, Japan and Korea (Ben-Dov 1994). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *P. kraunhiae* has the potential to establish and spread in Australia.	Yes This species is a pest of multiple horticultural commodities grown in Australia (Ben-Dov 1994). Mealybugs directly damage their plant hosts and reduce productivity (Williams 2004; Park *et al.* 2010).	Yes[EP]
Planococcus lilacinus Cockerell, 1905 [Pseudococcidae] Coffee mealybug	Yes (Ben-Dov 2012c)	No records found	Yes While this species is not recorded on grape in Japan, grape is among this species identified hosts (Ben-Dov 2012c). *Planococcus lilacinus* has been associated with grape bunches in India (Tandon and Verghese 1987) and has been recorded being transported on fruit (MacLeod 2006).	Yes *Planococcus lilacinus* is extremely polyphagous, and feeds on various tropical, sub-tropical and shade trees including cocoa, guava, mango, citrus, potato, coffee, custard apple, tamarind and grapes (Tandon and Verghese 1987; MacLeod 2006). This species has been reported from tropical regions around the world as well as China and Japan (Ben-Dov 2012c). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *P. lilacinus* has the potential to establish and spread in Australia.	Yes This species has been identified as a serious threat to grape crops in India (Tandon and Verghese 1987).	Yes[EP]

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Plautia stali Scott, 1874 [Pentatomidae] Brown winged green stinkbug	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a)	No records found	No Adults feed on grape berries (Moriya 1995). However, the insects are likely to fall off the grape clusters when disturbed during the harvest procedures, so are not expected to follow the pathway (USDA-APHIS 2002).	Assessment not required	Assessment not required	No
Pseudaulacaspis pentagona (Targioni-Tozzetti, 1886) Synonym: *Diaspis pentagona* Targioni-Tozzetti, 1886 [Diaspidae] White peach scale	Yes (JSAE 1987; MAFF 1989a; MAFF 2008b; Ben-Dov 2012b)	Yes NSW, Qld (Plant Health Australia 2001a) No records found for WA. However, WA does not require mitigation measures for this pest for other hosts (such as stonefruit) from Australian states where this pest is present (Poole *et al.* 2011; DAFWA 2014).	Assessment not required	Assessment not required	Assessment not required	No
Pseudococcus comstocki (Kuwana, 1902) [Pseudococcidae] Comstock's mealybug	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a; Ben-Dov 2012c)	No records found	Yes This species is a pest of grapes (JSAE 1987; MAFF 2008a), attacking the branches, fruit and leaves (USDA-APHIS 2002; Li 2004; Zhang 2005; NPQS 2007a).	Yes *Pseudococcus comstocki* is highly polyphagous and can feed from hosts including apple, pear, peach, grape and pine (Ben-Dov 2012c). These hosts are available in Australia. This species has been recorded from multiple countries around the world, including France, China, Indonesia, the US and Argentina (Ben-Dov 2012c). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *P. comstocki* has the potential to establish and spread in Australia.	Yes This species is a pest of numerous crops (Ben-Dov 2012c). It damages the leaves and fruit of grapevines and produces honeydew on the fruit surface (Zhang 2005).	Yes[EP]

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Pseudococcus longispinus (Targioni Tozzetti, 1867) [Pseudococcidae] Long-tailed mealybug	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012c)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Pulvinaria horii (Kuwana, 1902) Synonym: *Lecanium horii* (Takahashi, 1955) [Coccidae] Cottony maple scale	Yes (JSAE 1987; Ben-Dov 2012a)	No records found	No While this species attacks grapevine (JSAE 1987), *Pulvinaria* scales feed from leaves and twigs (MAFF 1990a; Smith *et al.* 1997). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Riptortus pedestris (Fabricius, 1775) [Alydidae] Bean bug	Yes (Tadauchi and Inoue 2006)	No records found	No Though this species feeds from stems and fruit of grapevines (Zhang 2005), it drops or flies away from its host if disturbed (Alcock 1971).	Assessment not required	Assessment not required	No
Saissetia coffeae (Walker, 1852) [Coccidae] Hemispherical scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012a)	Yes NSW, NT, Qld, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Saissetia oleae (Olivier, 1791) [Coccidae] Black scale	Yes (JSAE 1987; MAFF 1990a; Ben-Dov 2012a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Trialeurodes vaporariorum (Westwood, 1856) [Aleyrodidae] Grape whitefly	Yes (JSAE 1987)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Hymenoptera						
Ceratina dentipes Friese, 1914 [Apidae] Carpenter bee	Yes (Tadauchi and Inoue 2006)	No records found	No The larvae of this species feed only on woody parts of grapevine (Luo *et al.* 2005).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Polistes chinensis antennalis Pérez, 1905 [Vespidae] Asian paper wasp	Yes (Tadauchi and Inoue 2006)	Yes NSW (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No Though this species occasionally feeds on grape berries, it flies away if disturbed (Li 2004).	Assessment not required	Assessment not required	No
Vespa mandarinia Smith, 1852 [Vespidae] Asian giant hornet	Yes (Salt and Bequaert 1929)	No records found	No Though this species occasionally feeds on grape berries, it flies away if disturbed (Spradbery 1973).	Assessment not required	Assessment not required	No
Lepidoptera						
Acosmeryx castanea Rothschild and Jordan, 1903 [Sphingidae] Hawk moth	Yes (JSAE 1987)	No records found	No This species feeds on grapevine (JSAE 1987; Pittaway and Kitching 2006). However, Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Acosmeryx naga (Moore, 1858) [Sphingidae] Hawk moth	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds only on leaves on grapevine (Pittaway and Kitching 2006).	Assessment not required	Assessment not required	No
Adoxophyes privatana (Walker, 1863) [Tortricidae] Leafroller moth	Yes (Yasuda 1975)	No records found	No Though this species is a pest of grapevine, it feeds on rolled leaves (Robinson *et al.* 2008). Larvae produce easily spotted webbing and drop from the host if disturbed (Meijerman and Ulenberg 2000a).	Assessment not required	Assessment not required	No
Agrius convolvuli (Linnaeus, 1758) [Sphingidae] Sweetpotato horn worm	Yes (JSAE 1987; MAFF 2003)	Yes NT, Tas, WA (Plant Health Australia 2001a; CSIRO 2005), NSW, Qld, SA, Vic (CSIRO 2005)	Assessment not required	Assessment not required	Assessment not required	No
Agrotis ipsilon (Hufnagel, 1766) [Noctuidae] Black cutworm	Yes (JSAE 1987; Mizukoshi 1999)	Yes NSW, NT, Qld, SA, Tas, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Agrotis segetum (Denis and Schiffermuller, 1775) [Noctuidae] Turnip moth	Yes (Tadauchi and Inoue 2006)	No records found	No Agrotis cutworms feed on buds, shoots and bark of grapevine, and only at night (Hely *et al.* 1982).	Assessment not required	Assessment not required	No
Ampelophaga khasiana Rothschild, 1895 [Sphingidae] Hawk moth	Yes (JSAE 1987)	No records found	No Although this species attacks grapevine (Pittaway and Kitching 2006), it feeds only on leaves (Zhang 2005).	Assessment not required	Assessment not required	No
Ampelophaga rubiginosa Bremer & Grey, 1853 [Sphingidae] Grape hornworm	Yes (JSAE 1987)	No records found	No Though the larvae of this species attack grapevine (Common 1990), they feed only on leaves (Zhang 2005)	Assessment not required	Assessment not required	No
Amphipyra livida corvina Motschulsky, 1866 [Noctuidae] Fruit piercing moth	Yes (JSAE 1987)	No records found	No Adults are fruit piercing moths, but feed only at night and larvae only feed on leaves and often fall to the ground when disturbed (Hattori 1969).	Assessment not required	Assessment not required	No
Amphipyra pyramidea (Linnaeus, 1758) Synonym: *Amphipyra pyramidoides* Guenée, 1852 [Noctuidae] Copper underwing	Yes (JSAE 1987; MAFF 1989a)	No records found	No Larvae of this species feed on leaves and fruit skin on grapevine (Zhang 2005). However, larvae drop to the soil to pupate before the fruit approaches maturity and are therefore not present during harvest (Rings 1968).	Assessment not required	Assessment not required	No
Anomis flava (Fabricius, 1775) [Noctuidae] Cotton leaf caterpillar	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Anomis mesogona (Walker, 1858) [Noctuidae] Fruit piercing moth	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a)	No records found	No Adults attack the fruit of grapevine (JSAE 1987), but feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Antispila inouei Kuroko, 1987 [Heliozelidae]	Yes (JSAE 1987; van Nieukerken *et al.* 2012)	No records found	No Larvae of this species are leaf-miners and are not associated with grape bunches (van Nieukerken *et al.* 2012).	Assessment not required	Assessment not required	No
Antispila uenoi Kuroko, 1987 [Heliozelidae]	Yes (Tadauchi and Inoue 2006; van Nieukerken *et al.* 2012)	No records found	No Larvae of this species are leaf-miners and are not associated with grape bunches (van Nieukerken *et al.* 2012).	Assessment not required	Assessment not required	No
Aporia crataegi (Linneaus, 1758) [Pieridae] Black-veined white moth	Yes (Sato 1978; Zhang 1994; Grichanov and Ovsyannikova 2009a)	No records found	No Larvae of this species feed on leaves (Robinson *et al.* 2008; Grichanov and Ovsyannikova 2009a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Archips podana (Scopoli, 1758) Synonyms: *Tortrix podana* Scopoli 1763 [Tortricidae] Great brown twist moth	No While *A. podana* has been listed as present in Japan (Carter 1984; Zhang 1994), these reports are not substantiated by more recent records (Tadauchi and Inoue 2006; MAFF 2013d).	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Arcte coerulea (Guenée, 1852) [Noctuidae] Ramie caterpillar	Yes (JSAE 1987; MAFF 1989a; MAFF 2008a)	Yes (Nielsen *et al.* 1996) Not known to be present in WA (Poole 2010).	No Adults attack the fruit of grapevine (JSAE 1987; Zhang 1994), but feed only at night and are not associated with grapevine during the day (Hattori 1969; MAFF 2008a).	Assessment not required	Assessment not required	No
Artena dotata (Fabricius, 1794) As *Lagoptera dotata* Fabricius in (Li 2004). [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1990a)	No records found	No Larvae feed on leaves (Holloway 2010) and adults are not associated with fruit during daylight (Li 2004).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Asteropetes noctuina (Butler, 1878) [Agaristidae]	Yes (JSAE 1987; Zhang 1994)	No records found	No Larvae of this species feed only on leaves (USDA-APHIS 2002).	Assessment not required	Assessment not required	No
Autographa gamma (Linnaeus, 1758) [Noctuidae] Silver-Y moth	Yes (Zhang 1994; Kaneko and Konishi 1995; Tadauchi and Inoue 2006)	No records found	No Larvae of this species scrape the skin from grapes and feed on the fruit contents (Abdullagatov and Abdullagatov 1986). However, larvae feed at night and shelter under leaves during the day (Venette *et al.* 2003).	Assessment not required	Assessment not required	No
Calyptra gruesa (Draudt, 1950) [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1989a; MAFF 2008a)	No records found	No Adults attack fruit of grapevine (JSAE 1987; MAFF 2008a), but feed at night and are not associated with grapevine during the day (Hattori 1969; Zhang 1994).	Assessment not required	Assessment not required	No
Calyptra hokkaida (Wileman, 1922) [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1989a; MAFF 2008b)	No records found	No Adults attack grape berries (JSAE 1987) but feed at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Calyptra lata (Butler, 1881) Synonym: *Oraesia lata* (Butler, 1881) [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1989a; Robinson *et al.* 2007; MAFF 2008a)	No records found	No Adults attack grape berries (JSAE 1987; MAFF 2008a) but feed at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Calyptra thalictri (Borkhusen, 1790) [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1989a)	No records found	No Adults attack grape berries (JSAE 1987; NPQS 2007a) but feed at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Catocala actaea Felder and Rogenhofer,1874 [Noctuidae] White-mark hind winged noctuid	Yes (Tadauchi and Inoue 2006)	No records found	No Larvae of this species feed on leaves (Barlow 1982). The adults would not be associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Conogethes punctiferalis (Guenée, 1854) Synonym: *Dichrocrosis punctiferalis* Guenée, 1854 [Crambidae] Yellow peach moth	Yes (MAFF 1989a; MAFF 1990a; Zhang 1994; MAFF 2008b)	Yes (Nielsen *et al.* 1996) NSW, NT, Qld, SA, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Cossus cossus orientalis Gaede, 1929 [Cossidae] Goat moth	Yes (Tadauchi and Inoue 2006)	No records found	No Cossid moth larvae feed internally on the woody parts of plants (Grichanov 2009). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Cossus jezoensis (Matsumura, 1931) [Cossidae] Oriental carpenter moth	Yes (JSAE 1987)	No records found	No Though this species attacks grapevine (JSAE 1987), Cossid moth larvae feed internally on the woody parts of plants (Grichanov 2009). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Deilephila elpenor (Linneaus, 1758) [Sphingidae] Elephant hawk moth	Yes (Zhang 1994)	No records found	No This species feeds on grapevine (Zhang 1994; Pittaway and Kitching 2006). However, Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Diaphania indica (Saunders, 1851) Synonym: *Palipta indica* [Pyralidae] Cotton caterpillar	Yes (JSAE 1987; Zhang 1994)	Yes NSW, NT, Qld, WA (Zhang 1994; Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Endoclyta excrescens (Butler, 1877) Synonym: *Phassus exeresens* Butler, 1877 [Hepialidae] Japanese swift moth	Yes (JSAE 1987; MAFF 1989a; Kan *et al.* 2002; MAFF 2008a)	No records found	No Larvae feed internally on woody parts of the plant (Zhang 2005; Imai *et al.* 2010).	Assessment not required	Assessment not required	No

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Endoclyta sinensis (Moore, 1877) [Hepialidae] Grape tree-borer	Yes (JSAE 1987; MAFF 1989a)	No records found	No Larvae of this genus feed internally on tree roots and branches (Zhang 2005; Imai *et al.* 2010).	Assessment not required	Assessment not required	No
Ercheia umbrosa Butler 1881 [Noctuidae]	Yes (Hattori 1969)	No records found	No Adults attack grape berries, but feed at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Eudocima fullonia (Clerck, 1764) Synomyn: *Othreis fullonia* Clerck, 1764 [Noctuidae] Fruit piercing moth	Yes (JSAE 1987; MAFF 1989a; MAFF 2003)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Eudocima tyrannus (Guenée, 1852) Synonym: *Adris tyrannus* (Guenée, 1852) [Noctuidae] Akebia leaf-like moth	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2003; MAFF 2008a)	No records found	No Though adults of this species attack grape berries (JSAE 1987; MAFF 2008a), they feed at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Eulithis ledereri (Bremer, 1864) [Geometridae] Oriental grape vine looper	Yes (JSAE 1987)	No records found	No This species feeds only on leaves (USDA-APHIS 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Eumeta japonica (Heylaerts, 1884) [Psychidae] Giant bagworm	Yes (JSAE 1987; MAFF 1990a)	No records found	No Larvae feed on leaves, twigs and the surface of fruit (MAFF 1990a) from an easily identified bag case (Holloway *et al.* 1987). This species is likely to be removed during the harvesting and processing of grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Eumeta variegata (Snellen, 1879) Synonym: *Clania variegata* (Snellen, 1879) [Psychidae] Paulownia bagworm	Yes (Zhang 1994; Niitsu and Lobbia 2010)	No records found	No Larvae feed on leaves and externally on fruit (Zhang 2005; AQSIQ 2007a) from an easily identified bag case (Holloway *et al.* 1987). This species is likely to be removed during the harvesting and processing of grape bunches.	Assessment not required	Assessment not required	No
Eupoecilia ambiguella (Hübner, 1796) [Tortricidae] Grape berry moth	Yes (JSAE 1987; Frolov 2009a)	No records found	Yes Second generation moths lay eggs directly onto grape berries (Frolov 2009a) and larvae bore into the fruit (Marcelin 1985).	Yes *Eupoecilia ambiguella* feeds on many crops grown commercially in Australia (Brown *et al.* 2008a). This species has a wide distribution (Frolov 2009a) suggesting a capability to survive in a range of environments found in Australia.	Yes Larvae bore into berries and eat the pulp, destroying up to 12 berries per larva (Frolov 2009a).	Yes[EP]
Helicoverpa armigera (Hübner, 1805) [Noctuidae] Cotton bollworm	Yes (JSAE 1987; MAFF 2003; Mito and Uesugi 2004)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Herpetogramma luctuosalis (Guenée, 1854) [Pyralidae]	Yes (JSAE 1987; Tadauchi and Inoue 2006; MAFF 2008a)	No records found	No Larvae roll and feed on leaves (Li 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Hyles lineata livornica (Esper, 1779) [Sphingidae] Striped hawk moth	Yes (Zhang 1994; Tadauchi and Inoue 2006)	No records found	No Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Hyphantria cunea (Drury 1770) [Arctiidae] Mulberry moth	Yes (JSAE 1987; MAFF 1989a; Gomi *et al.* 2004)	No records found	No This species feeds only on foliage (FAO 2007a; Grichanov and Ovsyannikova 2009b).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Illiberis tenuis (Butler, 1877) Synonym: *Iuiberis tenuis* [Zygaenidae] Grape leaf worm	Yes (JSAE 1987)	No records found	No Larvae feed on young shoots, flowers, leaves and occasionally on young fruit of grapevine (Zhang 2005). This species would not be associated with grape bunches at harvest.	Assessment not required	Assessment not required	No
Ischyja manlia (Cramer, 1776) [Noctuidae] Fruit-piercing moth	Yes (Tadauchi and Inoue 2006)	Yes Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No This species feeds on grapevine at night (Walker 2007) and shelters in leaves during the day (Li 2004). This species would not be associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Lobesia botrana (Denis & Schiffermuller, 1775) [Tortricidae] European grapevine moth	No The records of this species in Japan are based on misidentified specimens (Bae and Komai 1991; MAFF 2013d).	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Loepa katinka (Westwood, 1847) [Saturniidae] Golden emperor moth	Yes Recorded as: *Loepa katinka sakaei* Inoue, 1965 (Tadauchi and Inoue 2006).	No records found	No Saturniid moth larvae feed exclusively on foliage (Common 1990).	Assessment not required	Assessment not required	No
Mamestra brassicae (Linnaeus, 1758) [Noctuidae] Cabbage moth	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a)	No records found	No The larvae of this species feed only on leaves of grapevine, (Ovsyannikova and Grichanov 2009) and hide on the ground during the day (Carter 1984).	Assessment not required	Assessment not required	No
Marumba gaschkewitschii (Bremer & Grey, 1852) [Sphingidae] Peach horn worm	Yes (Zhang 1994)	No records found	No Larvae only feed on foliage (Zhang 2005; MAFF 2012). Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Mocis undata (Fabricius, 1775) [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987)	No records found	No Only adults attack grape berries and are not associated with grapevine during the day (Li 2004; Robinson *et al.* 2008).	Assessment not required	Assessment not required	No
Nippoptilia vitis (Sasaki, 1913) [Pterophoridae] Grape plume moth	Yes (JSAE 1987; MAFF 2008a)	No records found	Yes This species attacks grape (JSAE 1987; MAFF 2008a) and larvae feed internally in the fruit (Li 2004; Zhang 2005).	Yes Adults are highly mobile and feed on grapes (BAIRC 2007), which are widely distributed in Australia. This species is recorded from China, Japan, Korea, Taiwan and Thailand (Yano 1963a; BAIRC 2007). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *N. vitis* has the potential to establish and spread in Australia.	Yes *Nippoptilia vitis* causes a significant decline in grape yield and fruit quality (Zheng *et al.* 1993; BAIRC 2007). Infestation by larvae destroys grape berries (MAFF 2008a).	Yes[EP]
Nokona regalis (Butler, 1878) Synonym: *Paranthrene regalis* (Butler 1878) [Sesiidae] Grape clearwing moth	Yes (JSAE 1987; MAFF 2008a)	No records found	No Larvae bore into vine stem (Wu and Huang 1986; Zhou 1999). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Ochyrotica concursa (Walsingham, 1891) [Pterophoridae] Brown leaf folder	Yes (JSAE 1987)	No records found	No This species feeds only on leaves (Ames *et al.* 1997).	Assessment not required	Assessment not required	No
Oraesia emarginata (Fabricius, 1794) [Noctuidae] Small oraesia	Yes (JSAE 1987; MAFF 1990a; MAFF 2008a)	Yes (Nielsen *et al.* 1996) Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No Though this species attacks grape berries (JSAE 1987), it feeds only at night and is not associated with grapevine during the day (Hattori 1969; Li 2004; MAFF 2008a).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Oraesia excavata (Butler, 1878) [Noctuidae] Reddish oraesia	Yes (JSAE 1987; MAFF 1990a; MAFF 2008a)	No records found	No Though this species attacks grape berries (JSAE 1987) it feeds only at night and is not associated with grapevine during the day (Hattori 1969; Li 2004; MAFF 2008a).	Assessment not required	Assessment not required	No
Orgyia postica (Walker, 1855) [Lymantriidae] Cocoa tussock moth	Yes (JSAE 1987) (Zhang 1994)	No records found	No Larvae feed and pupate on leaves and stems (MAF Biosecurity New Zealand 2009b). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Parallelia arctotaenia Guenée, 1852 [Noctuidae]	Yes (JSAE 1987; MAFF 1989a)	Yes (Nielsen *et al.* 1996) Not known to be present in WA (Poole 2010).	No Adults of this species attack grape berries (JSAE 1987). However, they feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Parallelia maturata (Walker, 1858) Synonym: *Dysgonia maturate* (Walker, 1858) [Noctuidae] Purplish thick-legged moth	Yes (JSAE 1987; MAFF 1990a)	No records found	No Adults of this species attack grape berries (JSAE 1987; Zhang 1994). However, they feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Parallelia stuposa (Fabricius, 1794) [Noctuidae]	Yes (Hattori 1969)	No records found	No Adults of this species attack grape berries, but feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Paranthrene regalis (Butler, 1878) [Sesiidae] Grape clearwing moth	Yes (JSAE 1987; Zhang 1994; MAFF 2008a)	No records found	No Larvae feed on leaves and stems of grapevine (MAFF 2008a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Pergesa acteus (Cramer, 1779) [Sphingidae] Hawk moth	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds on grapevine (JSAE 1987; Pittaway and Kitching 2006). However, Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Peridroma saucia (Hübner, 1808) [Arctiidae] Variegated cutworm	Yes (Inomata *et al.* 2002)	No records found	No This species feeds only at night, sheltering in the soil during the day (Mau and Martin Kessing 2007).	Assessment not required	Assessment not required	No
Phyllocnistis toparcha Meyrick, 1918 [Gracillariidae] Grape leafminer	Yes (JSAE 1987)	No records found	No While this species attacks grapevine (JSAE 1987; Zhang 1994), larvae create tunnels, or mines, in the leaves (de Prins and Kawahara 2009). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Platyptilia ignifera Meyrick, 1908 [Pterophoridae] Large grape plume moth	Yes (JSAE 1987; Zhang 1994; MAFF 2008a)	No records found	Yes Larvae bore into grape berries and feed internally on the fruit (Zhang 1994; MAFF 2008a).	Yes Hosts, *Vitus spp.* are present in Australia. This species has 2–3 generations per year (MAFF 2008a). *Platyptilia ignifera* is recorded from Japan, Taiwan (Zhang 1994) and India (Sidhu *et al.* 2010). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *P. ignifera* has the potential to establish and spread in Australia.	Yes Infestation by larvae destroys grape berries (MAFF 2008a). This species is considered an economic pest in its native range (Yano 1963b; MAFF 2008a).	Yes

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Plusiodonta casta (Butler, 1878) [Noctuidae]	Yes (Hattori 1969; JSAE 1987; MAFF 1990a)	No records found	No Adults of this species attack grape berries, but feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Psyche niphonica (Hori, 1926) Synonym: *Fumea niphonica* Hori, 1926 [Psychidae] Persimmon bagworm	Yes (JSAE 1987; Zhang 1994)	No records found	No Larvae feed from an easily identified bag case (Holloway *et al.* 1987). Psychidae feed on leaves (Rhainds *et al.* 2009). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Rhagastis mongoliana (Butler, 1876) [Sphingidae]	Yes (JSAE 1987; Zhang 1994)	No records found	No Although this species attacks grapevine (JSAE 1987; Pittaway and Kitching 2006), it feeds only on foliage (Zhang 2005).	Assessment not required	Assessment not required	No
Sarbanissa subflava (Moore, 1877) Synonym: *Seudyra subflava* Moore, 1877 [Noctuidae] Boston ivy tiger-moth	Yes (JSAE 1987; Zhang 1994)	No records found	No This species feeds only on shoots and leaves (Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Scoliopteryx libatrix (Linnaeus, 1758) [Noctuidae]	Yes (Hattori 1969)	No records found	No Adults attack fruit of grapevine, but feed only at night and are not associated with grapevine during the day (Hattori 1969).	Assessment not required	Assessment not required	No
Serrodes campana Guenée 1852 [Noctuidae] Fruit-piercing moth	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a)	Yes NSW, Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No Adults attack fruit of grapevine (JSAE 1987), but feed only at night and are not associated with grapevine during the day (Hattori 1969; NPQS 2007a).	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Sparganothis pilleriana (Denis & Schiffermuller 1775) Synonym: *Tortrix pilleriana* (Denis & Schiffermuller 1775) [Tortricidae] Grapevine leaf roller	Yes (Carter 1984; JSAE 1987; Tadauchi and Inoue 2006; Frolov 2009b)	No records found	Yes Larvae feed on the shoot tips, leaves, flowers and fruit of grapevines (Picard 1913; Schmidt-Tiedemann *et al.* 2001; Louis *et al.* 2002; NPQS 2007a).	Yes *Sparganothis pilleriana* attacks many plants including *Prunus* and grapevine (Carter 1984; Louis *et al.* 2002). These hosts are present in Australia. This species is recorded from Europe, across Asia and into North Africa (Carter 1984; Louis *et al.* 2002). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *S. pilleriana* has the potential to establish and spread in Australia.	Yes Larvae of *S. pilleriana* may cause substantial economic damage by feeding on shoot tips, leaves, inflorescences, young grapes and grape bunches, also causing reduction in fruiting (Schmidt-Tiedemann *et al.* 2001; Louis *et al.* 2002). In Spain 40 per cent of grapevines are infested by *S. pilleriana* (Cabezuelo 1980).	Yes[EP]
Spilosoma imparilis (Butler, 1877) [Arctiidae] Mulberry tiger moth	Yes (JSAE 1987; MAFF 1989a)	No records found	No Larvae of this genus feed on leaves (MAFF 1990a; Srivastava 1997). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Spirama retorta (Clerck, 1764) [Noctuidae] Owlet moth	Yes (Tadauchi and Inoue 2006)	No records found	No Adults feed on fruit at night; they are not associated with grape during the day (Li 2004).	Assessment not required	Assessment not required	No
Spodoptera exigua (Hübner, 1808) [Noctuidae] Beet armyworm	Yes (JSAE 1987; Zhang 1994)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Spodoptera litura Fabricius, 1775 [Noctuidae] Cotton leafworm	Yes (JSAE 1987; MAFF 1990a; Zhang 1994)	Yes NSW, NT, Qld, Tas, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

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Stathmopoda auriferella (Walker, 1864) [Oecophoridae] Apple heliodinid	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; Yamazaki and Sugiura 2003)	No records found	Yes Larvae of this species feed on grape berries (MAFF 1989a; USDA-APHIS 2002; NPQS 2007a).	Yes This species has a wide host range including apple, avocado, citrus, grapes, mango and pomegranate (MAFF 1989a). These hosts are available in Australia. This species is found in Korea (Park *et al.* 1994), Japan (JSAE 1987) and Western Africa (ICRISAT 1985). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *S. auriferella* has the potential to establish and spread in Australia.	Yes *Stathmopoda auriferella* has been identified as a key insect pest of fruit (Park *et al.* 1994) and damages leaves, buds and fruit on a wide range of commercial crops (Yamazaki and Sugiura 2003).	Yes[EP]
Theretra alecto (Linneaus, 1758) [Sphingidae] Hawk moth	Yes (Tadauchi and Inoue 2006)	No records found	No This species feeds on grapevine (Zhang 1994; Pittaway and Kitching 2006). However, Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Theretra clotho (Drury, 1773) Synonym: *Sphinx clotho* (Drury, 1773) [Sphingidae] Hawk moth	Yes (Tadauchi and Inoue 2006)	Yes Qld (Plant Health Australia 2001a) No records for WA	No This species feeds on grapevine (CABI 2012). However, Sphingids oviposit on leaves while larvae feed on leaves or occasionally stems and pupate in the soil (Australian Museum 2009).	Assessment not required	Assessment not required	No
Theretra japonica (Boisduval, 1869) [Sphingidae] Hawk moth	Yes (JSAE 1987; Zhang 1994)	No records found	No This species feeds only on leaves (Zhang 2005).	Assessment not required	Assessment not required	No

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Theretra oldenlandiae (Fabricius, 1775) [Sphingidae] Hawk moth	Yes (JSAE 1987)	Yes NSW, NT, Qld, SA, Vic, WA (CSIRO 2005)	Assessment not required	Assessment not required	Assessment not required	No
Thinopteryx crocoptera Kollar, [Geometridae] Colourful looper moth	Yes Recorded as: *Thinopteryx crocoptera striolata* Butler, 1883 (Tadauchi and Inoue 2006)	No records found	No This species feeds and pupates on leaves (Barlow 1982). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Thyas juno (Dalman, 1823) Synonym: *Lagoptera juno* Dalman, 1823 [Noctuidae] Rose of Sharon leaflike moth	Yes (JSAE 1987; MAFF 2008b)	No records found	No Adults feed on fruit at night but are not associated with grape during the day (Hattori 1969; JSAE 1987; Li 2004). Larvae develop on walnut (MAFF 2008b).	Assessment not required	Assessment not required	No
Trichosea champa (Moore, 1879) [Noctuidae]	Yes (Tadauchi and Inoue 2006)	No records found	No Though this species attacks grapevine (Zhang 1994), larvae feed on foliage (Wu 1977). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Xestia c-nigrum (Linnaeus, 1758) [Arctiidae] Spotted cutworm	Yes (JSAE 1987; Zhang 1994)	No records found	No Larvae feed on ripening fruit (Molinari *et al.* 1995). However, the larvae feed only at night and hide in the ground during the day (Carter 1984; Pfeiffer 2009).	Assessment not required	Assessment not required	No
Xestia efflorescens (Butler, 1879) [Noctuidae]	Yes (JSAE 1987)	No records found	No Noctuid moths are inactive during the day and shelter away from host plants (Hattori 1969; Common 1990)	Assessment not required	Assessment not required	No

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Zeuzera coffeae Nietner, 1861 [Cossidae] Coffee carpenter	Yes (Tadauchi and Inoue 2006)	No records found	No Larvae bore into stems and trunks of grapevine (Li 2004; CABI 2012). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Zeuzera pyrina (Linnaeus, 1761) [Cossidae] Leopard moth	Yes (Zhang 1994)	No records found	No Larvae tunnel inside stems and branches of grapevine (INRA 1997b; Li 2004). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Orthoptera						
Oecanthus indicus Saussure, 1878 [Gryllidae] Singing tree cricket	Yes (JSAE 1987)	No records found	No This species lays eggs into mature branches of grapevine (Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Thysanoptera						
Anaphothrips obscurus (Müller, 1776) [Thripidae] Grass thrips	Yes (JSAE 1987)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

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Drepanothrips reuteri Uzel, 1895 [Thripidae] Grape thrips	Yes (Tadauchi and Inoue 2006)	No records found	Yes This species feeds on leaves stems and fruit of grapevine (Flaherty *et al.* 1992a).	Yes *Drepanothrips reuteri* feeds on *Vitis spp.* and can survive on deciduous trees such as oak (Mound and Palmer 1981). These hosts are available in Australia. This species also has a high reproductive rate (Mound and Teulon 1995). This species is recorded from Japan, England, France, Italy, Greece, Chile and the US (Mound and Palmer 1981). Environments with climates similar to these regions exist in various parts of Australia, suggesting that *D. reuteri* has the potential to establish and spread in Australia.	Yes This species damages plants directly, both by feeding and ovipositing on the plant, and is a vector for viruses (Mound and Teulon 1995).	Yes[EP]
Frankliniella occidentalis (Pergande, 1895) [Thripidae] Western flower thrips	Yes (MAFF 1990a; Mito and Uesugi 2004)	Yes NSW, Qld, SA, Tas, Vic, WA, (Plant Health Australia 2001a) Not known to be present in NT	Yes This species feeds on leaves, stems, flowers and fruit of grapevine (Flaherty *et al.* 1992a; Childers 1997; USDA-APHIS 2002; Kirk and Terry 2003; Kulkarni *et al.* 2007)	Yes Hosts of *F. occidentalis* include chrysanthemums, cucurbits, cotton, grapes, citrus and apple (CABI 2012). These hosts are available in Australia. This species has already successfully spread across most of Australia (Kirk and Terry 2003).	Yes Feeding by this species causes serious shoot stunting, leaf distortion and berry scarring (Lewis 1997)	Yes (NT)[EP]
Heliothrips haemorrhoidalis (Bouché, 1833) Synonym: *Thrips haemorrhoidalis* [Thripidae] Greenhouse thrips	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Tas Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Scirtothrips dorsalis Hood, 1919 [Thripidae] Yellow tea thrips	Yes (JSAE 1987; MAFF 1990a; MAFF 2008a)	Yes NSW, NT, Qld, WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No

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Selenothrips rubrocinctus (Giard, 1901) [Thripidae] *Red-banded thrips*	Yes (Mito and Uesugi 2004)	Yes NSW, NT, Qld, SA, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Thrips coloratus Schmutz, 1913 Synonym: *Thrips japonicas* Bagnall, 1914 [Thripidae] Loquat thrips	Yes (JSAE 1987; MAFF 1990a)	Yes NT, Qld (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Thrips flavus Schrank, 1776 [Thripidae] Honeysuckle thrips	Yes (JSAE 1987; MAFF 1990a)	Yes NSW (Plant Health Australia 2001a) Not known to be present in WA (Poole 2010).	No This species feeds on leaves, flowers and shoots (Wen and Lee 1982; MAFF 1990a). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Thrips hawaiiensis Morgan 1913 [Thripidae] Hawaiian flower thrips	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Thrips setosus Moulton, 1928 [Thripidae]	Yes (JSAE 1987; Sakurai *et al.* 2004)	No records found	No This species feeds on leaves and roots of its hosts (USDA 2002). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Thrips tabaci Lindeman, 1888 [Thripidae] Onion thrips	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a; Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Trombidiformes						
Brevipalpus californicus (Banks, 1904) [Tenuipalpidae] Citrus flat mite	Yes (Mito and Uesugi 2004)	Yes NSW, NT, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

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Brevipalpus lewisi McGregor, 1949 [Tenuipalpidae] Grape bunch mite	Yes (JSAE 1987; MAFF 1990a; MAFF 2008a)	Yes NSW, SA, Vic (Plant Health Australia 2001a) WA (Poole 2008)	Assessment not required	Assessment not required	Assessment not required	No
Brevipalpus obovatus Donnadieu, 1875 [Tenuipalpidae] Privet mite	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, Vic, WA (Plant Health Australia 2001a)	Assessment not required.	Assessment not required	Assessment not required	No
Brevipalpus phoenicis (Geijskes, 1930) [Tenuipalpus] False spider mite	Yes (Ehara 1966)	Yes NT, NSW, SA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Bryobia praetiosa Koch, 1835 [Tetranychidae] Clover mite	Yes (JSAE 1987; Migeon and Dorkeld 2012)	Yes NSW, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Bryobia rubrioculus (Scheuten, 1857) [Tetranychidae] Bryobia mite	Yes (JSAE 1987; MAF Biosecurity New Zealand 2000; Migeon and Dorkeld 2012)	Yes NSW, Qld, SA, Tas, Vic, WA (Gutierrez and Schicha 1983)	Assessment not required	Assessment not required	Assessment not required	No
Calepitrimerus vitis (Nalepa, 1905) [Eriophyidae] Grape rust mite	Yes (Denizhan 2011)	Yes NSW, SA, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Colomerus vitis (Pagenstecher, 1857) Synonym: *Eriophyes vitis* (Pagenstecher, 1857) [Eriophyidae] Grape bud mite	Yes (JSAE 1987)	Yes NSW, SA, Vic, WA (Plant Health Australia 2001a) Qld, Tas (CSIRO 2005) *Colomerus vitis* can vector Grapevine berry inner necrosis virus (Kunugi *et al.* 2000), which is present in Japan (MAFF 2008a; NIAS 2012), but is not known to be present in Australia. Although *C. vitis* is present in Australia, the potential for *C. vitis* carrying Grapevine berry inner necrosis virus warrants further assessment for this species.	No The *C. vitis* erineum strain forms galls on upper surfaces of leaves; the bud mite strain results in blisterlike growths on buds; and the leaf-curl strain causes downward curling of leaves (Flaherty *et al.* 1992a). No records have been found which associate this species with grape bunches. Note: Should *Colomerus vitis* be reported as being associated with grape bunches in the future and/or be detected in table grape consignments, it will be treated as a quarantine pest of concern for Australia and the categorisation for this pest will then need to be re-assessed.	Assessment not required	Assessment not required	No
Eotetranychus lewisi (McGregor, 1943) [Tetranychidae] Lewis spider mite	Yes (Mito and Uesugi 2004)	No records found	No On citrus, *E. lewisis* is mostely found on fruit (Jeppson *et al.* 1975). Though it attacks grapevine (Migeon and Dorkeld 2012), no records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Eotetranychus smithi Pritchard et Baker, 1955 [Tetranychidae] Smith spider mite	Yes (Ehara 1960; JSAE 1987; Migeon and Dorkeld 2012)	No records found	No This mite generally feeds on leaves and does not produce much webbing (Jeppson *et al.* 1975). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Eotetranychus tiliarium (Hermann, 1804) Synonym: *Acarus telarius* (Linnaeus 1758) [Tetranychidae] Two-spotted spider mite	Yes (Migeon and Dorkeld 2012)	No records found	No While this species attacks grapevine (USDA-APHIS 2002), it feeds only on leaves (Zhang 2005). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Eutetranychus orientalis (Klein, 1936) [Tetranychidae] Oriental spider mite	Yes (Yogi *et al.* 1999; Mito and Uesugi 2004; Migeon and Dorkeld 2012)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a) Qld (Walter *et al.* 1995)	Assessment not required	Assessment not required	Assessment not required	No
Oligonychus coffeae (Nietner, 1861) [Tetranychidae] Tea red spider mite	Yes (Migeon and Dorkeld 2012)	Yes NSW, NT, Qld (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Panonychus citri (McGregor, 1916) [Tetranychidae] Citrus red mite	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; Fujimoto and Hiramatsu 1995; Fujimoto *et al.* 1996; Migeon and Dorkeld 2012)	Yes NSW (Plant Health Australia 2001a) NSW, SA (CSIRO 2005) Not known to be present in WA (Poole 2010).	No Though this species attacks grapevine (Wu and Lo 1989; Migeon and Dorkeld 2012), feeding occurs on leaves (Jeppson *et al.* 1975). No records have been found which associate this species with grape bunches.	Assessment not required	Assessment not required	No
Panonychus ulmi (Koch, 1835) [Tetranychidae] European red spider mite	Yes (JSAE 1987; MAFF 1989a; Fujimoto and Hiramatsu 1995; MAFF 2003; Migeon and Dorkeld 2012)	Yes NSW, SA, Tas, Vic, WA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Petrobia latens (Müller, 1776) [Tetranychidae] Brown wheat mite	Yes (JSAE 1987; Migeon and Dorkeld 2012)	Yes NSW, Tas (Halliday 1998; Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Phytonemus pallidus (Banks, 1899) Synonym: *Steneotarsonemus pallidus* (Banks, 1899) [Tarsonemidae] Cyclamen mite	Yes (JSAE 1987)	Yes NSW, Tas (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Polyphagotarsonemus latus (Banks, 1904) [Tarsonemidae] Potato broad mite	Yes (JSAE 1987; MAFF 1990a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus cinnabarinus (Boisduval, 1867) [Tetranychidae] Carmine spider mite	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; Migeon and Dorkeld 2012)	Yes NSW, Qld, SA, Tas, Vic, WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus kanzawai Kishida, 1927 Synonym: *Tetranychus hydrangeae* [Tetranychidae] Kanzawa spider mite	Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a; Migeon and Dorkeld 2012)	Yes NSW, Qld (Gutierrez and Schicha 1983) Not present in WA (Poole 2010).	Yes *Tetranychus kanzawai* mites and webbing are often found on the under surfaces of the leaves, but can occasionally attack and breed on grape berries (Ho and Chen 1994; Ashihara 1996; CABI 2012).	Yes *Tetranychus kanzawai* feeds on multiple hosts including grape, apple, plum, peach, capsicum and hydrangea (Migeon and Dorkeld 2006). These hosts are available in Australia. This species is recorded from China, Greece, India, Japan, Korea and Mexico (Migeon and Dorkeld 2006). It has also been introduced to, and has successfully established in Queensland and NSW (Gutierrez and Schicha 1983). Environments with climates similar to these regions exist in various parts of Western Australia, suggesting that *T. kanzawai* has the potential to establish and spread in WA.	Yes *Tetranychus kanzawai* is a significant pest subject to quarantine measures in many parts of the world (Navajas *et al.* 2001).	Yes (WA)[EP]

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tetranychus ludeni Zacher, 1913 [Tetranychidae] Bean spider mite Note: This species has been misidentified in Japan as *Tetranychus desertorum* Banks 1900 (Ehara and Masaki 1989). Therefore citations of *T. desertorum* in Japan most likely refer to *T. ludeni*.	Yes (JSAE 1987; Ehara and Masaki 1989; Ehara 1999; Migeon and Dorkeld 2012)	Yes NSW, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus neocaledonicus (André, 1933) [Tetranychidae] Vegetable spider mite	Yes (Mito and Uesugi 2004; Ohno *et al.* 2009; Migeon and Dorkeld 2012)	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a) WA (Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tetranychus piercei McGregor, 1950 [Tetranychidae] Banana leaf mite	Yes (Ehara 1999; Gotoh *et al.* 2007; Migeon and Dorkeld 2012) However, no records have been found that associate this species with grapevines in Japan. (Note: Should this pest be detected on grapevines in Japan in the future, this would need to be reported to Australia immediately. The categorisation for this pest would then need to be re-assessed.) There is only an isolated record of this species being rarely observed on grapevines in Taiwan (Ho *et al.* 1997). This species is not recorded as a pest of grapevines elsewhere.	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus turkestani (Ugarov and Nikolskii, 1937) [Tetranychidae] Strawberry spider mite	No This species is not present in Japan (MAFF 2013d). The report of *T. turkestani* as present in Japan by Jeppson (1975) was based on unconfirmed records.	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus urticae Koch, 1836 [Tetranychidae] Two spotted spider mite	Yes (JSAE 1987; MAFF 1989a; MAFF 2008a)	Yes NSW, NT, Qld, SA, Tas, Vic, WA (Plant Health Australia 2001a)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
BACTERIA						
Pantoea agglomerans (Beijerinck 1888) Gavini *et al.* 1989 Synonym: *Erwinia herbicola* (Lohnis 1911) Dye 1964 [Enterobacteriales: Enterobacteriaceae] Bacterial grapevine blight	Yes (CABI 2011). Very widespread. Probably worldwide (Bradbury 1970).	Yes NSW, Qld, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Pseudomonas syringae pv. *syringae* van Hall 1902 [Pseudomonadales: Pseudomonoadaceae] Bacterial canker	Yes (MAFF 2008b).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Pseudomonas viridiflava (Burkholder 1930) Dowson 1939 [Pseudomonadales: Pseudomonoadaceae] Bacterial leaf blight of tomato	Yes Isolated from *Vitis vinifera* L., Shimane, Japan (JSCC 2012).	Yes NSW, Qld, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Rhizobium radiobacter (Beijerinck & van Delden) Young *et al.* 2001 Synonym: *Agrobacterium tumefaciens* (Smith and Townsend 1907) Conn 1942 [Rhizobiales: Rhizobiaceae] Crown gall	Yes On grape (MAFF 1989b; Kawaguchi and Inoue 2009).	Yes NSW, Qld, SA, Tas., Vic. (Plant Health Australia 2001a). WA (Shivas 1989).	Assessment not required	Assessment not required	Assessment not required	No
Rhizobium vitis (Ophel & Kerr 1990) Young *et al.* 2001 Synonym: *Agrobacterium vitis* (Ophel & Kerr 1990) [Rhizobiales: Rhizobiaceae] Crown gall of grapevine	Yes On grape (Burr *et al.* 1998).	Yes NSW, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Xanthomonas arboricola Vauterin, Hoste, Kersters and Swings 1995 [Xanthomonadales: Xanthomonadaceae]	Yes On grape (NIAS 2012).	Yes NSW, Qld, SA, Tas., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Xylophilus ampelinus (Panagopoulos 1969) Willems, Gillis, Kersters, Van den Broecke, & De Ley 1987 Synonym: *Xanthomonas ampelina* Panagopoulos 1969 [Xanthomonadales: Xanthomonadaceae] Bacterial blight of grapevine	Yes On grape (NIAS 2012).	No records found.	Yes *Xylophilus ampelinus* causes necrosis and canker, mainly on the woody parts of *Vitis vinifera* (Willems *et al.* 1987). It can cause cracks and cankers on fruit stalks (Panagopoulos 1988; EPPO 2009c). However, in international trade, *X. ampelinus* is considered to be dispersed through the movement of infected grapevine planting material (CABI-EPPO 1997b).	Yes Hosts, *Vitis* spp., are available in Australia. This pathogen can be moved with infected planting material (CABI-EPPO 1997b). It is also spread by grafting and pruning (Bradbury 1991). This pathogen has been reported present in France, Greece, Italy, Moldova, Portugal, Slovenia, South Africa, Turkey and Spain (Panagopoulos 1988; CABI-EPPO 1997b). Environments with climates similar to these regions exist in various parts of Australia suggesting that *X. ampelinus* has the potential to establish and spread in Australia.	Yes This bacterium causes a chronic, systemic disease of grapevine which is of significant economic importance. It affects commercially important cultivars (Panagopoulos 1988).	Yes
CHROMALVEOLATA						
Plasmopara viticola (Berk. & M. A. Curtis) Berl. & De Toni (1888) [Peronosporales: Peronosporaceae] Grapevine downy mildew	Yes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
FUNGI						
Acrospermum viticola Ikata and Hitomi [Acrospermales: Acrospermaceae] Leaf spot	Yes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No This pathogen causes leaf blight of grapevine (Ikata and Hitomi 1931; Farr and Rossman 2012). It only infects leaves of grape (Li 2004; AQSIQ 2006b). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Alternaria alternata (Fr. Fr.) Keissl [Pleosporales: Pleosporaceae] Alternaria leaf blight, brown spot	Yes Reported on a number of hosts in Japan, but not on grape (Kobayashi 2007). Is known to cause Alternaria rot of grape elsewhere (Hewitt 1988).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Aspergillus carbonarius (Bainier) Thom [Eurotiales: Trichocomaceae]	Yes (Miyoshi *et al.* 2007; JSCC 2012). Recorded on *Vitis vinifera* in the US and South Africa (Farr and Rossman 2012).	Yes Vic. (Leong *et al.* 2004); NSW (Plant Health Australia 2001a); Qld, SA and Vic. (Leong *et al.* 2006). Not known to be present in WA.	Yes Causes rot in grape berries (Leong *et al.* 2004). In Japan, it is associated with rot of citrus fruit (Miyoshi *et al.* 2007).	Yes *Aspergillus* spores drift on air currents and disperse both short and long distances. When they come into contact with solid or liquid surfaces, if the moisture conditions are right, they germinate. *Aspergillus* disperse easily and grow almost anywhere when food and water are available (Bennett 2010).	No *Aspergillus* spp. are secondary invaders of grape berries that have been damaged by insects, pathogens, environmental factors such as rain and wind (Somma *et al.* 2012), or through fractures caused by partial detachment of berries at the pedicel (Jarvis and Traquair 1984). Furthermore, *A. niger* is already present in WA (Plant Health Australia 2001a) and is associated with grape berries (Leong *et al.* 2006). Introduction of this species is unlikely to have significant economic effects.	No
Aspergillus fumigatus Fresen. [Eurotiales: Trichocomaceae]	Yes (JSCC 2012). *Aspergillus* spp. are wound and secondary invaders on grape berries (Hewitt 1988).	Yes NSW, Qld, WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aspergillus japonicus Saito [Eurotiales: Trichocomaceae]	Yes (Miyoshi *et al.* 2007).	No records found	Yes Associated with rotting grape berries (Bejaoui *et al.* 2006; Somma *et al.* 2012). In Japan, it is associated with rot of citrus fruit (Miyoshi *et al.* 2007).	Yes *Aspergillus* spores drift on air currents and disperse both short and long distances. When they come into contact with solid or liquid surfaces, if the moisture conditions are right, they germinate. *Aspergillus* disperse easily and grow almost anywhere when food and water are available (Bennett 2010).	No *Aspergillus* spp. are secondary invaders of grape berries that have been damaged by insects, pathogens, environmental factors such as rain and wind (Somma *et al.* 2012), or through fractures caused by partial detachment of berries at the pedicel (Jarvis and Traquair 1984). Furthermore, many species of *Aspergillus* are already present in Australia (Plant Health Australia 2001a) and *A. carbonarius*, *A. niger* and *A. aculeatus* are all known to be associated with grape berries already (Leong *et al.* 2006).	No
Aspergillus niger Tiegh. [Eurotiales: Trichocomaceae]	Yes On grapes (Kobayashi 2007; NIAS 2012).	Yes ACT, NSW, NT, Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Aspergillus terreus Thom [Eurotiales: Trichocomaceae]	Yes (JSCC 2012). Cosmopolitan distribution (Farr and Rossman 2012). Reported on *V. vinifera* in Spain (Farr and Rossman 2012).	Yes NSW, Qld (Plant Health Australia 2001a) WA (Kelly *et al.* 1995) Cosmopolitan distribution (Farr and Rossman 2012).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aureobasidium pullulans (de Bary) G. Arnaud [Dothideales: Dothioraceae]	Yes On persimmons and rice in Japan (NIAS 2012). No records found for grapes. Reported on *Vitis* spp. in other countries (Farr and Rossman 2012)	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Botryosphaeria dothidea (Moug.: Fr.) Ces. & De Not. Synonym: *Fusicoccum aesculi* Corda [Botryosphaeriales: Botryosphaeriaceae] Macrophoma rot	Yes On grape (Kobayashi 2007).	Yes NSW, Qld, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Botryosphaeria obtusa (Schwein.) Shoemaker Synonym: *Diplodia seriata* De Not. [Botryosphaeriales: Botryosphaeriaceae] Dead arm	Yes On apple in Japan (NIAS 2012). Cosmopolitan distribution. Hosts include *Vitis* spp. (Farr and Rossman 2012).	Yes ACT, NSW, Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Botryosphaeria parva Pennycook & Samuels Synonym: *Neofusicoccum parvum* (Pennycook & Samuels) Crous, Slippers & A.J.L. Phillips [Botryosphaeriales: Botryosphaeriaceae]	Yes Recorded on a number of hosts, including *Vitis* sp. in Japan (Slippers *et al.* 2007).	Yes NSW, NT, Qld, WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Botryosphaeria ribis Grossenb. & Duggar Synonym: *Neofusicoccum ribis* (Slippers, Crous & M.J. Wingf.) Crous, Slippers & A.J.L. Phillips [Botryosphaeriales: Botryosphaeriaceae]	Yes Reported on citrus, apple, peach and *Ribes sinanense* in Japan (Farr and Rossman 2012). Hosts include *Vitis vinifera* (Farr and Rossman 2012).	Yes ACT, NSW, Qld, Vic., WA (Plant Health Australia 2001b; Sakalidis *et al.* 2011).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Botrytis cinerea Pers.: Fr. Synonym: *Botryotinia fuckeliana* (de Bary) Whetzel [Helotiales: Sclerotiniaceae] Grey mould rot	Yes On grapes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes ACT, NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Briosia ampelophaga Cavara [Ascomycetes: incertae sedis] Brown zonate spot, leaf blotch	Yes On grapes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	No records found	No Isolated from grapevine leaf (JSCC 2012). Causes leaf spot/blotch of grapevine (McGrew and Pollack 1988b; Nasu *et al.* 1994; Schilder 2011). The only association with grape berries found is that it can also sporulate on overripe berries and berries that are left on the vine past normal harvest time (McGrew and Pollack 1988b; Schilder 2011). It is not known to be associated with fresh harvested grape bunches for export.	Assessment not required	Assessment not required	No
Cladosporium cladosporioides (Fresen.) GA de Vries [Capnodiales: Davidiellaceae]	Yes On grapes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Cladosporium herbarum (Pers.: Fr.) Link [Capnodiales: Davidiellaceae] Cladosporium rot	Yes On grapes (MAFF 1989b; Kobayashi 2007).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Colletotrichum acutatum J.H. Simmonds Synonym: *Glomerella acutata* Guerber & J.C. Correll [Phyllacorales: Glomerellaceae]] Anthracnose	Yes On grape (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Colletotrichum fioriniae (J.A.P. Marcelino & S. Gouli) R.G. Shivas & Y.P. Tan Synonym: *Colletotrichum acutatum* var. *fioriniae* J.A.P. Marcelino & S. Gouli [Phyllacorales: Glomerellaceae]	Yes Isolated from *V. vinifera* in Japan (NIAS 2012)	Yes Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Coniella fragariae (Oudem.) B. Sutton [Diaporthales: Schizoparmaceae]	Yes (Kobayashi 2007).	Yes NSW, Qld, Vic. (Plant Health Australia 2001a). WA isolates of *Pilidiella diplodiella* were recently re-identidied as *Coniella fragariae*.	Assessment not required	Assessment not required	Assessment not required	No
Cylindrocarpon destructans var. *destructans* (Zinssm.) Scholten Synonym: *Cylindrocarpon destructans* (Zinssm.) Scholten [Hypocreales: Nectriaceae]	Yes Reported on a number of hosts in Japan, but not on *Vitis* spp. (Kobayashi 2007). Reported on *Vitis* in other countries (Farr and Rossman 2012).	Yes ACT, NSW, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Diaporthe faginea (Curr.) Sacc. Synonym: *Diaporthe medusaea* Nitschke [Diaporthales: Diaporthaceae]	Yes On grapes (Fukaya and Kato 1994; Kobayashi 2007; NIAS 2012).	Yes One record for NSW—on *Erigeron* sp. (Plant Health Australia 2001a). Not known to be present in WA.	No Found on bark of branches and twigs, also reported on leaves of its hosts (Farr and Rossman 2012). Causes bud blight of grapevine (Fukaya *et al.* 1988; Fukaya and Kato 1994). No association with grape bunches was found.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Diaporthe melonis var. *brevistylospora* Ts. Kobay. & Tak. Ohsawa Synonym: *Phomopsis brevistylospora* Ts. Kobay. & Tak. Ohsawa [Diaporthales: Diaporthaceae] Berry drop	Yes On grapes and melon (NIAS 2012).	No records found	Yes Causes dieback of pedicels followed by berry drop in the middle of grape clusters at harvest time (Kinugawa *et al.* 2008).	Yes Hosts, including grapevine and melon are widely grown in Australia. Environments with climates similar to Japan exist in various parts of Australia suggesting that *Diaporthe melonis* var. *brevistylospora* has the potential to establish and spread in Australia.	Yes Causes dieback of pedicels followed by berry drop in the middle of grape clusters at harvest time mainly on cultivars Pione, Muscat Bailey A and Muscat of Alexandria (Kinugawa *et al.* 2008). Also causes postharvest rot of rockmelon (Ohsawa and Kobayashi 1989). It is also pathogenic to fruits of kiwifuit, satsuma mandarin and apple (Kinugawa *et al.* 2008).	Yes
Diatrype stigma (Hoffm.) Fr. Synonym: *Sphaeria stigma* Hoffm. [Xylariales: Diatrypaceae]	Yes Reported on a number of hosts in Japan, but not on *Vitis* (Farr and Rossman 2012). Reported on *Vitis vinifera* in California, US (Trouillas *et al.* 2010; Farr and Rossman 2012).	Yes Only recorded in NT (Plant Health Australia 2001a). Not known to be present in WA.	No Reported from cankered wood of grapevines in California (Trouillas *et al.* 2010; Trouillas and Gubler 2010). Trouillas and Gubler (2010) report colonisation of dormant canes/ mature wood causing vascular necrosis. Moreover, no perithecia have been found in association with grapevine material, suggesting it may not be capable of completing its life cycle on grapevines (Trouillas and Gubler 2010). No association with grape bunches was found.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Diatrypella verruciformis (Ehrh.) Nitschke Variant spelling *Diatrypella verrucaeformis* (Ehrh.) Nitschke Synonym: *Sphaeria verruciformis* Ehrh. [Xylariales: Diatrypaceae]	Yes Reported on *Callicarpa japonica* (Japanese beautyberry) in Japan (Kobayashi 2007; NIAS 2012). Reported on *Vitis vinifera* in California, US (Trouillas and Gubler 2010; Farr and Rossman 2012).	No records found	No Reported in association with cankered wood of grapevines (Trouillas and Gubler 2010). Isolates were unable to produce lesions experimentally, suggesting it is a saprophyte rather than pathogenic on grapevines (Trouillas and Gubler 2010). Perithecia are rarely observed on grapevines, suggesting it is not capable of completing its life cycle on its grapevine hosts (Trouillas and Gubler 2010). No association with grape bunches was found.	Assessment not required	Assessment not required	No
Discosia artocreas (Tode: Fr.) Fr. [Xylariales: Amphisphaeriaceae]	Yes Recorded as *Discosia atrocreas* (Tode) Fries on a number of hosts, including *Vitis vinifera* (Kobayashi 2007).	No records found	No This pathogen affects leaves of various host plants (Farr and Rossman 2012; Mycobank 2012). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Elsinoë ampelina Shear Synonyms: *Sphaceloma ampelinum* de Bary, *Gloeosporium ampelophagum* (Pass.) Sacc. [Myriangiales: Elsinoaceae] Grape anthracnose	Yes On grapes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes NSW, NT, Qld, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Epicoccum nigrum Link [Dothideales: Dothioraceae] Cereal leaf spot	Yes On a number of hosts in Japan, but not on *Vitis* spp. (Farr and Rossman 2012).	Yes ACT, NSW, Qld, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Erysiphe necator var. *necator* Schwein. Synonyms: *Oidium tuckeri* Berk., *Uncinula necator* (Schw) Burrill, *Erysiphe necator* Schwein. [Erysiphales: Erysiphaceae] Grapevine powdery mildew	Yes On grapes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Eutypella aequilinearis (Schwein. : Fr.) Starbäck Synonym: *Cytospora vitis* Mont., *Valsa vitis* (Schwein. : Fr.) M.A. Curtis [Xylariales: Diatrypaceae] Valsa canker	Yes On grapes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No Causes valsa canker (Kobayashi 2007; NIAS 2012). Found on bark of hosts (Farr and Rossman 2012). Isolated from the trunks and branches of *Vitis* species (Catal *et al.* 2007). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Fusarium oxysporum Schltdl. : Fr. [Hypocreales: Nectriaceae] Fusarium wilt	Yes Reported on many species in Japan, but not on *Vitis* (Kobayashi 2007; NIAS 2012; Farr and Rossman 2012).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Fusarium proliferatum (Matsushima) Nirenberg ex Gerlach & Nirenberg Synonym: *Cephalosporium proliferatum* Matsush. [Hypocreales: Nectriaceae]	Yes Reported on aloe,cymbidium, maize and red malabar nightshade in Japan (NIAS 2012). Occurs widely on grape berries and has been investigated as a biocontrol agent against grapevine downy mildew in the US (Falk *et al.* 1996).	Yes NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Fusarium solani (Mart.) Sacc. Synonyms: *Haematonectria haematococca* (Berk. & Broome) Samuels & Rossman, *Nectria haematococca* Berk. & Broome [Hypocreales: Nectriaceae]	Yes On a number of species in Japan, but not on *Vitis* (Kobayashi 2007; Farr and Rossman 2012). *Vitis vinifera* is a host (CABI 2011).	Yes NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Geotrichum candidum Link [Saccharomycetales: Dipodascaceae] Fruit rot	Yes On grapes (Kobayashi 2007; NIAS 2012).	Yes NSW, NT, Qld, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Glomerella cingulata (Stoneman.) Spauld. & H. Schrenk Synonym: *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. [Phyllachorales: Glomerellaceae] Anthracnose	Yes On grapes (Kobayashi 2007; MAFF 2008a).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a). Tas. (Sampson and Walker 1982).	Assessment not required	Assessment not required	Assessment not required	No

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Greeneria uvicola (Berkley & M.A. Curtis) Punithalingam Synonym: *Melanconium fuligineum* (Scribn. & Viala) Cavara [Diaporthales: Gnomoniaceae] Bitter rot	Yes On grapes (MAFF 1989b; Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes Only known to be present in NSW and Qld (Plant Health Australia 2001a). Not known to be present in WA.	Yes Bitter rot can affect young shoots, stems of fruit bunches, pedicels and berries. *Greeneria uvicola* usually attacks berries via the pedicel. Within a few days of infection, berries soften and are bitter to taste, some are easily detached while others shrivel and mummify (McGrew 1988; Momol *et al.* 2007).	Yes In Australia, *G. uvicola* has been reported from north-eastern New South Wales and Queensland (Sergeeva *et al.* 2001; Plant Health Australia 2001a; Steel *et al.* 2007). *Greeneria uvicola* has also been reported from Brazil, Costa Rica, Greece, India, Japan, New Zealand, South Africa and the USA (Sutton and Gibson 1977; McGrew 1988). Environments with climates similar to these regions exist in various parts of WA suggesting that *G. uvicola* has the potential to establish and spread in WA. Hosts are *Vitis* spp. (Sutton and Gibson 1977; Farr and Rossman 2012), which are widely grown in WA.	Yes *Greeneria uvicola* attacks many species of grape, including *Vitis vinifera* (European grape), *V. labrusca* (fox grape) and *V. rotundifolia* (muscadine grape) (Sutton and Gibson 1977). Affected berries shrivel and rot or become soft, bitter-tasting and are easily detached (McGrew 1988). *Greeneria uvicola* can also cause girdling of the shoots of *V. vinifera* cultivars (McGrew 1988). *Greeneria uvicola* has also been reported to cause rot on mature fruit of apple, cherry, strawberry, peach and banana under experimental conditions (Ridings and Clayton 1970).	Yes (WA)
Guignardia bidwellii (Ellis) Viala & Ravaz Synonym: *Phyllosticta ampelicida* (Engelm.) Van der Aa [Botryosphaeriales: Botryosphaeriaceae] Black spot	Yes On grapes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	Yes Affects grape leaf, stem, peduncle and fruit (Ramsdell and Milholland 1988; NPQS 2007a; CABI 2011). The pathogen attacks all parts of the vine, particularly the berry clusters (Singh *et al.* 1999).	Yes This species overwinters in mummified berries, in the vine or on the ground. Ascospores are airborne and disperse moderate distances and conidia are splash dispersed only short distances (Wilcox 2003). This species has a range of hosts, including *Ampelopsis* spp., *Cissus* spp., *Citrus* spp., *Vitis* spp., *Arachis hypogaea* (peanut) and *Asplenium nidus* (bird's nest fern), which are widely distributed in Australia (Eyres *et al.* 2006; Farr and Rossman 2012).	Yes Black rot is an important fungal disease of grapes in the northeastern US, Canada and parts of Europe, South America and Asia (Ramsdell and Milholland 1988; Wilcox 2003). Crop losses can range from 5 to 80 per cent (Ramsdell and Milholland 1988), depending on inoculum levels, weather and cultivar susceptibility.	Yes[EP]

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Helicobasidium mompa Tanaka [Helicobasidiales: Helicobasidiaceae] Violet root rot	Yes On grapes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No Causes root rot (Nakamura *et al.* 2004; Farr and Rossman 2012).	Assessment not required	Assessment not required	No
Hinomyces moricola (I. Hino) Narumi & Y. Harada Synonyms*: Grovesinia pyramidalis* M.H. Cline, J.L. Crane & S.P. Cline, *Cristulariella moricola* (I. Hino) Redhead [Helotiales: Sclerotiniaceae] Zonate leaf spot	Yes On grapes (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No Infects leaves (Li 2004). Isolated from grapevine leaf in Japan (JSCC 2012). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Kloeckera apiculata (Reess) Janke [Saccharomycetales: Saccharomycodaceae] Sour rot	Yes Isolated from fruit—exact source not recorded—and grape juice in Japan (JSCC 2012). Is an ascomycetous yeast which has been reported on grapes in Japan (Yanagida *et al.* 1992).	Yes WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Lasiodiplodia theobromae (Pat.) Griffon & Maubl. Synonyms: *Botryosphaeria rhodina* (Berk. & Curtis) Arx, *Botryodiplodia theobromae* Pat., [Botryosphaeriales: Botryosphaeriaceae] Lasiodiplodia cane dieback	Yes (CABI-EPPO 2010). Reported on many species in Japan, but not on *Vitis* (NIAS 2012; Farr and Rossman 2012). Is widely distributed and has a large number of hosts, including *Vitis* spp. in other countries (Farr and Rossman 2012).	Yes NSW, NT, Qld, SA, WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Macrophomina phaseolina (Tassi) Goid [Sphaeropsidales: Sphaeropsidaceae] Charcoal rot	Yes On many species in Japan, but not on *Vitis* (Farr and Rossman 2012). Hosts include *Vitis* (CABI 2011).	Yes ACT, NSW, NT, Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Marssonina viticola (Miyake) Tai [Leotiales: Dermateaceae]	Yes On grape (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No Causes ring spot on grapevine leaves (Hatamoto 1997). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Monilia polystroma G.van Leeuwen *et al.* [Heliotales: Sclerotiniaceae] Asiatic brown rot	Yes This fungus has been isolated from apples in Japan (van Leeuwen *et al.* 2002). A very similar species, *Monilinia fructigena*, is associated with grapes in Japan (Kobayashi 2007; NIAS 2012). Given the recently identified similarities between *Monilia polystroma* and *Monilinia fructigena* (van Leeuwen *et al.* 2002), it is likely that *M. polystroma* will be found on Japanese grapes.	No records found	Yes This fungus causes brown rot of fruit (van Leeuwen *et al.* 2002).	Yes *Monilia polystroma* has been recorded from Japan, China, Hungary, the Czech Republic and Switzerland (van Leeuwen *et al.* 2002; Petróczy and Palkovics 2009; Zhu and Guo 2010; EPPO 2011b; Hilber-Bodmer *et al.* 2012). Environments with climates similar to these regions exist in various parts of Australia. *Monilia polystroma* is closely related and very similar to *Monilinia fructigena* (van Leeuwen *et al.* 2002; Côté *et al.* 2004). The spores of *Monilinia fructigena* are dispersed by wind, water or insects (Jones 1990; Batra 1991). Hosts include species of *Malus*, *Prunus* and *Pyrus* (van Leeuwen *et al.* 2002; Petróczy and Palkovics 2009; Zhu and Guo 2010) which are widely available in Australia.	Yes *Monilia polystroma* causes fruit rot on species of *Cydonia*, *Malus*, *Prunus* and *Pyrus* (Chalkley 2012).	Yes

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Monilinia fructicola (G. Winter) Honey Synonym: *Monilia fructicola* L. R. Batra [Helotiales: Sclerotiniaceae] Brown rot	Yes On grapes (Kobayashi 2007).	Yes ACT, NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Monilinia fructigena (Aderh. & Ruhland) Honey Synonym: *Monilia fructigena* Schumach. [Helotiales: Sclerotiniaceae] Brown rot	Yes On grapes (Kobayashi 2007; NIAS 2012).	No records found	Yes Causes raised light brown pustules on the fruit that often expand, enclosing the fruit to form a dark, wrinkled, hard mummified fruit (USDA-APHIS 2004). Grape is not a main host (CABI 2011). The original record of *M. fructigena* on grape was in China (Qi *et al.* 1966 in (Tai 1979), which provided evidence of the anamorphic stage (*Monilia fructigena*) being associated with *Vitis vinifera*. This pathogen has also been reported to cause a soft brown rot of grape berries in both Italy and Japan (Ogata *et al.* 1999; Nanni *et al.* 2003).	Yes Brown rot disease caused by *M. fructigena* is a common and widespread disease of pome and stone fruit (Mackie *et al.* 2005). The spores of this fungus can be spread through wind and rain-spash (Jones 1990), as well as potentially being transported by various insects (CABI 2011). Hosts are widely available in Australia.	Yes *Monilinia fructigena* produces visible symptoms on grapes and causes raised light brown pustules that often expand enclosing the fruit to form a dark, wrinkled and hard mummified fruit (USDA-APHIS 2004). On more susceptible hosts, for example stone and pome fruit, *M. fructigena* can cause significant pre- and post-harvest fruit losses (Jones 1990; Mackie *et al.* 2005).	Yes[EP]
Neoscytalidium dimidiatum (Penz.) Crous & Slippers Synonym: *Hendersonula toruloidea* Nattrass; *Scytalidium dimidiatum* (Penz.) B. Sutton & Dyko [Botryosphaeriales: Botryosphaeriaceae]	Yes Reported as causing dry rot of pitaya in Japan (NIAS 2012). Causes branch wilt of a number of hosts, including grapevine (Wangikar *et al.* 1969; Punithalingam and Waterston 1970).	Yes NT and WA (Plant Health Australia 2001a). Qld as *Torula dimidiata* (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

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Passalora dissiliens (Duby) U. Braun & Crous Synonyms: *Phaeoramularia dissiliens* (Duby) Deighton, *Cercospora roesleri* (Catt.) Sacc. [Capnodiales: Mycosphaerellaceae]	Yes On grape (Kobayashi 2007) as *Phaeoramularia dissiliensis*.	No records found	No Causes variable leaf spot symptoms (Deighton 1976). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Penicillium expansum Link [Eurotiales: Trichocomaceae] Blue mould of stored apple	Yes Reported on a number of species in Japan, but not on grape (Kobayashi 2007). *P. expansum* is a postharvest pathogen of grapes (Franck *et al.* 2005).	Yes NSW, Qld, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Penicillium janthinellum Biourge [Eurotiales: Trichocomaceae]	Yes Reported on grape in Japan (NIAS 2012).	Yes ACT, NSW, Vic. (Plant Health Australia 2001a). Not known to be present in WA.	Yes *Penicillium* spp. are known to infect wounded grape berries (Hewitt 1988).	Yes *Penicillium* spp. affect most kinds of fruit and vegetables (Agrios 1997). *Penicillium janthinellum* has been isolated from dates, almonds,peanuts, pistachios, maize and barley (Kozakiewicz 2002). These hosts are available in WA and would facilitate the spread and establishment of *P. janthinellum*. Many other *Penicillium* spp. are established in Western Australia (Plant Health Australia 2001a) indicating the suitability of the WA environment.	No Mould rots caused by *Penicillium* spp. are common and can be destructive (Agrios 1997). *Penicillium* spp. can also produce mycotoxins that may be harmful to humans (Abrunhosa *et al.* 2001). However, rot-causing *Penicillium* spp. are wound and secondary invaders (Hewitt 1988). Current management practices and control measures for *Penicillium* spp. that are already present in Australia are likely to control any additional species.	No

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Penicillium viticola Nonaka & Masuma [Eurotiales: Trichocomaceae]	Yes (Nonaka *et al.* 2011). Isolated from fruit rind of grape, Yamanashi, Japan (JSCC 2012).	Yes Qld (Rivera and Seifert 2011). Not known to be present in WA.	Yes Was isolated from a grape bunch (Nonaka *et al.* 2011; JSCC 2012).	Yes *Penicillium* spp. affect most kinds of fruit and vegetables (Agrios 1997). *Vitis* and other fruit hosts are available in WA and would facilitate the spread and establishment of *P. janthinellum*. Many other *Penicillium* spp. are established in Western Australia (Plant Health Australia 2001a) indicating the suitability of the WA environment.	No Mould rots caused by *Penicillium* spp. are common and can be destructive (Agrios 1997). *Penicillium* spp. can also produce mycotoxins that may be harmful to humans (Abrunhosa *et al.* 2001). However, rot-causing *Penicillium* spp. are wound and secondary invaders (Hewitt 1988). Current management practices and control measures for *Penicillium* spp. that are already present in Australia are likely to control any additional species.	No
Pestalotiopsis funerea (Desm.) Steyaert [Xylariales: Amphisphaeriaceae] Leaf spot	Yes Reported on grape in Japan (Kobayashi 2007).	Yes NSW, Qld, Vic. (Plant Health Australia 2001a). Not known to be present in WA.	No Affects leaves, stems and roots of its hosts (Mordue 1976). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Pestalotiopsis malicola (Hori) X.A. Sun & Q.X. Ge Basionym: *Pestalotia malicola* Hori, nom. nud. [Xylariales: Amphisphaeriaceae]	Yes Reported on grape in Japan (Kobayashi 2007).	No records found	No Affects canes of *Vitis vinifera* (Guba 1961). On other hosts, it has also been reported on leaves and fruit (Guba 1961; Farr and Rossman 2012). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No

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Pestalotiopsis mangiferae (Henn.) Steyaert [Xylariales: Amphisphaeriaceae] Grey leaf spot of mango	Yes Reported on mango in Japan (NIAS 2012). No other reports found. Main host is *Mangifera indica*, but *Vitis vinifera* can also be a host (Mordue 1968).	Yes NT, WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Pestalotiopsis menezesiana (Bres. & Torr.) Bissett Synonym: *Pestalotia menezesiana* Bres. & Torr. [Xylariales: Amphisphaeriaceae]	Yes On grapes in Japan (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes NSW (Plant Health Australia 2001a; Sergeeva *et al.* 2005) Not known to be present in WA.	Yes Infects fruit (Mishra *et al.* 1974; Xu *et al.* 1999).	Yes *Pestalotiopsis menezesiana* infects *Cissus rhombifolia* (grape-ivy) (Bissett 1982), grapevine (Mishra *et al.* 1974; Xu *et al.* 1999), kiwifruit (Park *et al.* 1997) and plantain (Huang *et al.* 2007), which are present in Western Australia. *Pestalotiopsis menezesiana* is present in Australia (NSW), China, India, Japan and Korea (Mishra *et al.* 1974; Park *et al.* 1997; Xu *et al.* 1999; Plant Health Australia 2001a; Huang *et al.* 2007). Environments with climates similar to these regions exist in various parts of Western Australia.	Yes Grapevine, kiwifruit and plantain are commercially grown in Western Australia. This pathogen causes rot of grape berries (Mishra *et al.* 1974; Xu *et al.* 1999), leaf spot of kiwifruit (Park *et al.* 1997) and leaf spot of plantain (Huang *et al.* 2007).	Yes (WA)

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Pestalotiopsis uvicola (Speg.) Bissett [Xylariales: Amphisphaeriaceae] Berry rot, leaf spot	Yes On *Vitis vinifera* in Japan (Kobayashi 2007; NIAS 2012).	Yes NSW, Qld (Plant Health Australia 2001b). NSW (Sergeeva *et al.* 2005). Not known to be present in WA.	Yes Affects grape berries (Guba 1961; Xu *et al.* 1999; Sergeeva *et al.* 2005).	Yes In Australia, *P. uvicola* has been reported from NSW and Qld (Plant Health Australia 2001b). This pathogen has also been reported from Brazil, France, Italy and the US (Guba 1961). Environments with climates similar to these regions exist in various parts of WA suggesting that *P. uvicola* has the potential to establish and spread in WA. Hosts include *Vitis vinifera*, *Laurus nobilis* and *Mangifera indica* (Xu *et al.* 1999; Vitale and Polizzi 2005; Ismail *et al.* 2013) which are grown in WA.	Yes Has been reported to cause post-harvest disease of grapes (Xu *et al.* 1999), leaf spot and stem blight of bay laurel (*Laurus nobilis)* (Vitale and Polizzi 2005) and leaf spot of mango (Ismail *et al.* 2013).	Yes (WA)
Peyronellaea glomerata (Corda) Goid. ex Togliani Synonym: *Phoma glomerata* (Corda) Wollenw. & Hochapfel [Pleosporales: Pleosporaceae] Phoma blight	Yes Isolated from rough bark of apple trees in Japan (Koganezawa and Sakuma 1980). Reported on *Vitis vinifera* in India and Spain (Farr and Rossman 2012). *Vitis vinifera* is a host (Morgan-Jones 1967; Granata and Refatti 1981).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Phakopsora euvitis Y. Ono Synonym: *Physopella vitis* (Thüm.) Arthur [Pucciniales: Phakopsoraceae] Grape rust fungus	Yes (Ono 2000; CABI-EPPO 2007b).	No Recorded in NT (Plant Health Australia 2001a; Weinert *et al.* 2003) but has since been eradicated (EPPO 2007).	Yes Infects leaves of *Vitis vinifera* (CABI-EPPO 2006) and young shoots (Li 2004). Occasionally infects rachises (Leu 1988).	Yes *Phakopsora euvitis* established in the Northern Territory before eradication (Weinert *et al.* 2003). Spores of *P. euvitis* are wind dispersed (CABI-EPPO 2006).	Yes Can cause a serious grapevine disease (CABI-EPPO 2006).	Yes[EP]

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Phellinus igniarius (L. : Fr.) Quél. [Hymenochaetales: Hymenochaetaceae]	Yes On a number of hosts, including grape (NIAS 2012).	No Only one record for WA which is incomplete (Plant Health Australia 2001b). No other records found.	No Is found on living and dead hardwoods (Farr and Rossman 2013b). Known to be associated with wood decay of grapevine (Larignon and Dubos 1997; Fischer 2000). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Phoma sp. Disease name (Japanese): 新梢萎縮病 [sinsho-ishuku-byo]	Yes (NIAS 2012)	Uncertain as species not specified However, many *Phoma* species have been recorded in all states and territories in Australia (Plant Health Australia 2001a).	No Infects leaves and shoots of *Vitis* spp. (Kishi 1998). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Phomopsis sp. Berry drop	Yes (Kinugawa *et al.* 2008). Species name has not been described (MAFF 2013d).	No Many species of *Phomopsis* have been recorded from all states and territories in Australia (Plant Health Australia 2001a). However, berry drop disease caused by a *Phomopsis* pathogen is not known to occur in Australia.	Yes Causes dieback of pedicels followed by berry drop in the middle of grape clusters (Kinugawa *et al.* 2008). The fungus was isolated from pedicels (Kinugawa *et al.* 2008; MAFF 2013d).	Yes *Vitis* hosts are widely available in Australia. Other species of *Phomopsis* are established in Australia (Plant Health Australia 2001a) indicating the suitability of the Australian environment.	Yes The disease causes berry drop in grape clusters (Kinugawa *et al.* 2008).	Yes

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Phomopsis viticola (Sacc.) Sacc. Synonyms: *Cryptosporella viticola* Shear, *Fusicoccum viticola* Reddick [Diaporthales: Valsaceae] Phomopsis cane and leaf spot	Yes On grapes (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes (Merrin *et al.* 1995) NSW, Qld, SA, Vic. (Plant Health Australia 2001a). Tas. (Mostert *et al.* 2001). Plant Health Australia (2001) also shows records for WA, but these have been shown to be *Diaporthe australafricana* or other species of *Phomopsis* other than *P. viticola* by sequencing of the ITS region.	Yes *Phomopsis viticola* infects all parts of the grape bunch (rachis, pedicels and berries) (Hewitt and Pearson 1988).	Yes *Phomopsis viticola* is established in temperate grape growing regions throughout the world including in Africa, Asia, Australia (except Western Australia), Europe and North America (Hewitt and Pearson 1988). Spores of *P. viticola* are dispersed by rain splash and insects within the vineyard. Long distance dispersal occurs by movement of infected/contaminated propagation material, pruning equipment and agricultural machinery (Burges *et al.* 2005).	Yes *Phomopsis viticola* is a serious pathogen of grapes in several viticultural regions around the world (Hewitt and Pearson 1988). It can cause vine stunting and reduced fruit yield and quality (Hewitt and Pearson 1988; Burges *et al.* 2005).	Yes (WA)[EP]
Phomopsis vitimegaspora K.C. Kuo & L.S. Leu Synonym: *Diaporthe kyushuensis* Kajitani & Kanem. [Diaporthales: Valsaceae] Grapevine swelling arm	Yes On grape (Kobayashi 2007; Udayanga *et al.* 2011; NIAS 2012).	No records found	No Affects canes and shoots of grapevine (Kajitani and Kanematsu 2000). It causes severe shoot blight and dead arm symptoms (Kuo and Leu 1998). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Phyllactinia ampelopsidis Yu & Lai Synonym: *Ovulariopsis ampelopsidis-heterophyllae* Sawada; *Phyllactinia corylea* auct. Jap. non (Persoon) Karsten [Erysiphales: Erysiphaceae] Powdery mildew	Yes On some *Vitis* spp. (Kobayashi 2007; Farr and Rossman 2012).	No records found	No Limited information available. *Phyllactinia ampelopsidis* was reported infecting leaves but not fruit of *Vitis flexuosa*, a wild species, in Japan. (Nomura 1997; MAFF 2013d). Recorded on leaves of *Ampelopsis heterophylla* (a climbing vine, Vitaceae) in Taiwan (Mycobank 2012). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Physalospora baccae sensu Nishikado non Cavara [Amphisphaeriales: Hyponectriaceae] Grape cluster black rot	Yes As *Botryosphaeria* sp. (synonyms *Guignardia baccae* (Cavara) Jaczewski and *Physalospora baccae* sensu Nishikado non Cavara) in MAFF (1989). As *Botryosphaeria* sp. (synonym *Guignardia baccae*) in MAFF (2008).	No records found	Yes *Physalospora baccae* mainly infects peduncles, pedicels and fruits of grapes (USDA-APHIS 2002; BAIKE 2009; NYZSW 2009). *Physalospora baccae* was assessed as on the pathway by USDA for the import of table grapes from South Korea (USDA-APHIS 2002).	Yes *Physalospora baccae* is present in China, eastern Europe, Japan, Portugal, South Korea and Spain (Nishikado 1921; Bensaude 1926; Berro Aguilera 1926; Vekesciaghin 1933; Shin *et al.* 1984; BAIKE 2009; NYZSW 2009). This suggests that this fungus can establish and spread under a wide range of climatic environments. Many other *Physalospora* species are already present and established in Australia (Plant Health Australia 2001a).	Yes The disease incidence of *P. baccae* is high in some years with hot and humid weather from July to September and in vineyards which are not well managed. For example, up to 75 per cent of fruit was infected in a vineyard in Jiangxi province, China (Li 1984). High disease incidence (about 30 per cent fruit infection rates) was also reported in vineyards in the provinces of Hunan, Fujian and Shanxi (Hu and Lin 1993; Gao *et al.* 1999).	Yes[EP]
Pilidiella castaneicola (Ellis & Everh.) Arx Synonyms: *Coniella castaneicola* (Ellis & Everh.) B. Sutton, *Schizoparme straminea* Shear [Diaporthales: Schizoparmaceae]	Yes On grape (Kobayashi 2007; NIAS 2013).	Yes NSW, NT, Qld, Vic., but not on grape (Plant Health Australia 2001a). On leaf of *Eucalyptus pellita* in Qld (Langrell *et al.* 2008). Not known to be present in WA.	Yes Causes white rot of table grapes. It affects rachis, pedicel and berries (Yamato 1995; Kishi 1998).	Yes This fungus has a variety of hosts (Farr and Rossman 2012). Hosts, including grapevine, are widely grown in Western Australia. In Australia, *P. castaneicola* has been reported from NSW, NT, Qld, Vic., (Plant Health Australia 2001a). *Pilidiella castaneicola* has also been reported from Brazil, Canada, China, Cuba, India, Indonesia, Japan, Korea, Pakistan, South Africa, Switzerland, the US and the West Indies (Farr and Rossman 2012). Environments with climates similar to these regions exist in various parts of WA suggesting that *P. castaneicola* has the potential to establish and spread in WA.	Yes Causes white rot of grapevine berries, (Yamato 1995; Kishi 1998) reducing marketability. Causes fruit rot of strawberries and is found on foliage of broadleafed trees (Farr and Rossman 2012). Is commonly found on leaves of *Eucalyptus*, but is of minor importance as a leaf pathogen (Van Niekerk *et al.* 2004).	Yes (WA)

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Pilidiella diplodiella (Speg.) Crous & Van Niekerk Synonyms: *Coniella diplodiella* (Speg.) Petr. & Syd.; *Coniothyrium diplodiella* (Speg.) Sacc [Diaporthales: Schizoparmaceae] Grapevine white rot	Yes On grape (MAFF 1989b; Yamato 1995). Isolated from *V. vinifera* in Japan (NIAS 2012).	Yes (Van Niekerk *et al.* 2004) NSW and WA—as *Coniella diplodiella* (Plant Health Australia 2001a); WA (Shivas 1989). However, the WA isolates were recently re-identidied as *Coniella fragariae.*	Yes Infects young and mature fruit, causing purple-brown spots, yellowing and then browning and drying out of the fruit (Lauber and Schuepp 1968).	Yes Hosts of *P. diplodiella, Vitis* spp. (Farr and Rossman 2012), are cultivated in Western Australia.	Yes *Pilidiella diplodiella* causes white rot of grapevine berries, reducing marketability (Bisiach 1988; Van Niekerk *et al.* 2004). It can also cause cankers in nonlignified shoots of grapevine (Bisiach 1988).	Yes (WA)
Pionnotes biasolettiana (Corda) Sacc. Synonyms: *Fusarium biasolettianum* Corda; *Fusisporium biasolettianum* (Corda) Saccardo [Hypocreales: Nectriaceae]	Yes On *Vitis vinifera* (Kobayashi 2007).	No records found.	No Is a saprophytic fungus infecting bark and stumps of woody plants such as *Alnus*, *Betula* and *Vitis* (Lindau 1910).	Assessment not required	Assessment not required	No
Pseudocercospora vitis (Lév.) Speg. Synonym: *Mycosphaerella personata* B.B. Higgins [Capnodiales: Mycosphaerellaceae] Grapevine leaf spot	Yes On grape (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes NSW, Qld, Vic. (Plant Health Australia 2001a). Not known to be present in WA.	No Infects leaves (McGrew and Pollack 1988a). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Rhizoctonia solani Kühn Synonym: *Thanatephorus cucumeris* (Frank) Donk [Ceratobasidiales: Ceratobasidiaceae] Damping off	Yes Reported in Japan on a number of hosts, but not on *Vitis* (Farr and Rossman 2012). Reported on *Vitis* spp. in Florida, Spain and China (Farr and Rossman 2012).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

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Rhizopus arrhizus A. Fischer [Mucorales: Mucoraceae] Fruit rot	Yes Reported on *Vigna radiata* (mung bean) (Farr and Rossman 2012) and on rice and sweet potato (NIAS 2012) in Japan. Is known to be associated with berry rot of grapevine elsewhere (Hewitt 1988).	Yes NSW, Vic. (Plant Health Australia 2001a). WA (Kew Royal Botanic Gardens 2013).	Assessment not required	Assessment not required	Assessment not required	No
Rhizopus stolonifer (Ehrenb.: Fr.) Vuill. [Mucorales: Mucoraceae] Fruit rot	Yes On *V. vinifera* (Kobayashi 2007).	Yes NSW, NT, Qld, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Sclerophora pallida (Pers.) Y.J. Yao & Spooner Synonym: *Roesleria pallida* (Pers.) Sacc. [Lecanoromycetidae: Coniocybaceae]	Yes On grape (Kobayashi 2007; NIAS 2012).	No records found	No Found on bark, often well below soil level (Farr and Rossman 2012). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Rosellinia necatrix Prill. Synonym: *Dematophora necatrix* R. Hartig [Xylariales: Xylariaceae] White root rot of trees	Yes On grape (Kobayashi 2007; MAFF 2008a; NIAS 2012)	Yes NSW, Qld, WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Schizophyllum commune Fr. [Agaricales: Agaricomycetidaeae] Schizophyllum rot	Yes Isolated from *Vitis vinifera i*n Japan (NIAS 2012).	Yes NSW, NT, Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Sclerotinia sclerotiorum (Lib.) de Bary Synonym: *Sclerotium varium* Pers. [Helotiales: Sclerotiniaceae] White mould	Yes On grape (MAFF 1989b; Kobayashi 2007; NIAS 2012)	Yes ACT, NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No

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Sclerotium rolfsii Sacc. Synonyms: *Athelia rolfsii* (Curzi) C.C. Tu & Kimbr., *Corticium rolfsii* Curzi [Poriales: Atheliaceae] Sclerotium stem rot	Yes On grape (MAFF 1989b; Kobayashi 2007; NIAS 2012).	Yes ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Septobasidium tanakae (Miyabe) Boedijn & Steinman Synonym: *Helicobasidium tanakae* Miyabe ex Matsumura [Septobasidiale: Septobasidiaceae] Felt disease	Yes On grape (MAFF 1989b; Kobayashi 2007; NIAS 2012).	No records found	No This fungus is found on trunks and twigs of a number of hosts, including *Vitis* (Tanaka 1918). *Septobasidium* species are found on woody parts of trees and are often associated with scale insects (McRitchie 1991). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Septoria badhamii Berk and Broome [Capnodiales: Mycosphaerellaceae]	Yes On *V. vinifera* (Kobayashi 2007).	No records found	No Affects leaves (USDA-APHIS 2002; NPQS 2007a). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Stemphylium botryosum Wallr. Synonym: *Pleospora tarda* E. G. Simmons [Pleosporales: Pleosporaceae] Stemphylium rot	Yes Reported on a number of hosts in Japan, but not on grape (NIAS 2012). Listed as a disease of grape causing berry rot or raisin mould (Pearson 1993).	Yes NSW, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Tilletiopsis washingtonensis Nyland [Telletiales: Exobasidiomycetidae]	Yes Isolated from *Vitis vinifera* in Japan (Urquhart *et al.* 1997).	Yes One record for Vic. (Plant Health Australia 2001a).	No On leaves (Farr and Rossman 2012). Members of this genus are saprophtyes and colonise the leaf surface (Urquhart *et al.* 1997). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No

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Trichothecium roseum (Pers.) Link [Hypocreales: incertae sedis] Pink mould rot	Yes On grape (Kobayashi 2007; NIAS 2012).	Yes ACT, NSW, Qld, SA, Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Truncatella angustata (Pers.) S. Hughes Synonyms: *Broomella acuta* Shoemaker & E. Müll., *Pestalotia affinis* Sacc. & Voglino [Xylariales: Amphisphaeriaceae]	Yes On grape (Kobayashi 2007; MAFF 2008a; NIAS 2012).	Yes (Sutton 1980) ACT, Vic. (Plant Health Australia 2001a; Sergeeva *et al.* 2005). Not known to be present in WA.	No Reported in association with stems/canes of *Vitis* (Plant Health Australia 2001a; Sergeeva *et al.* 2005) and as an endophyte on twigs and branches (González and Tello 2011). No report of association with grape bunches was found.	Assessment not required	Assessment not required	No
Verticillium dahliae Kleb. [Phyllachorales: Plectosphaerellacea] Verticillium wilt	Yes On grape (Kobayashi 2007; NIAS 2012)	Yes ACT, NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a).	Assessment not required	Assessment not required	Assessment not required	No
Zygophiala jamaicensis E.W. Mason Synonyms: *Leptothyrium pomi* (Mont. & Fr.) Sacc., *Schizothyrium pomi* (Mont. & Fr.) Arx [Capnodiales: Schizothyriaceae] Fly speck	Yes On grape (Kobayashi 2007; MAFF 2008a; NIAS 2012)	Yes WA (Plant Health Australia 2001a). NSW—*as Schizothyrium pomi* (Plant Health Australia 2001a). NSW, WA as *Leptothyrium pomi* (Plant Health Australia 2001a). Qld *as Schizothyrium pomi* (Simmonds 1966).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
VIROIDS						
Citrus exocortis viroid [Pospiviroidae: Pospiviroid]	Yes (CABI-EPPO 2007a) On citrus (Sano 2003b). No records found for grape in Japan. None of 143 grapevine leaf or fruit samples collected from major grapevine cultivating areas in Japan tested positive for *Citrus exocortis viroid* (Jiang *et al.* 2012). Grapevine has been recorded as a host of *Citrus exocortis viroid* in Spain, Australia and California (Little and Rezaian 2003).	Yes Only known to be present in NSW, Qld and SA (Barkley and Büchen-Osmond 1988). Not known to be present in WA.	Yes Grapevine is a host of *Citrus exocortis viroid* (Little and Rezaian 2003) and transmission of the viroid via grape seed has been observed (Wan Chow Wah and Symons 1997).	Yes Transmitted by grafting, abrasion and through seed (Little and Rezaian 2003; Singh *et al.* 2003; Albrechtsen 2006a). It can also infect all varieties of citrus (Hardy *et al.* 2008). It can also infect tomatoes, and can be carried asymptomatically in grapevine, broad bean, eggplant, turnip, carrot and ornamental plants including *Impatiens* and *Verbena* species (Singh *et al.* 2009).	Yes No record of economic losses caused by *Citrus exocortis viroid* in grapevines was found. However, *Citrus exocortis viroid* causes disease in citrus when infected budwood is grown on susceptible rootstocks (Hardy *et al.* 2008). In Australia, budwood testing for graft-transmissible citrus pathogens has been used to reduce the damage caused by the viroid (Hardy *et al.* 2008). Can also cause disease in tomato (Singh *et al.* 2009).	Yes (WA)[EP]
Grapevine yellow speckle viroid-1 [Pospiviroidae: Aspcaviroid]	Yes (Sano 2003b; NIAS 2012; Jiang *et al.* 2012).	Yes (Koltunow *et al.* 1989). Not known to be present in WA.	Yes Infects systemically; present in fruit and seed (Li *et al.* 2006; Albrechtsen 2006b).	Yes Transmitted by grafting, abrasion and through seed (Singh *et al.* 2003; Li *et al.* 2006; Albrechtsen 2006b).	Yes *Grapevine yellow speckle viroid-1* is one of the causative agents of Grapevine yellow speckle disease, individually or in combination with *Grapevine yellow speckle viroid-2* (Koltunow *et al.* 1989). Mixed infection of *Grapevine yellow speckle viroid-1* or *Grapevine yellow speckle viroid-2* and *Grapevine fanleaf virus* causes vein banding that has detrimental effect on the yield of certain varieties (Szychowski *et al.* 1995).	Yes (WA)[EP]

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Grapevine yellow speckle viroid-3 (Chinese grapevine viroid) [Pospiviroidae: Aspcaviroid]	Yes (Jiang *et al.* 2012). Previously known under the name type 3 *Grapevine yellow speckle viroid-1* (Jiang *et al.* 2012).	No records found	Yes Infects systemically, so probably present in grape berries (Jiang *et al.* 2009).	Yes Transmitted by grafting and abrasion. Seed transmission not reported (Jiang *et al.* 2009), but considered possible.	Yes Recently characterised viroid, closely related to *Grapevine yellow speckle viroid-1* (Jiang *et al.* 2009).	Yes[EP]
Hop stunt viroid [Pospiviroidae: Hostuviroid]	Yes Present on hop in Japan (Takahashi 1987). Present in grapevines in Japan (Sano *et al.* 1985; Sano *et al.* 1986; Sano 2003b; Jiang *et al.* 2012).	Yes Only known to be present in SA and Vic. (Koltunow *et al.* 1988). Not known to be present in WA.	Yes *Hop stunt viroid* has been demonstrated to be seed transmitted in grapevines (Wan Chow Wah and Symons 1999), but not in any other species. Wan Chow Wah and Symons (1999) confirmed that, in grapevines, *Hop stunt viroid* can be transmitted by seed to seedlings. (This authority is cited in (Little and Rezaian 2003) which is then cited in (Albrechtsen 2006a)). *Hop stunt viroid* infects systemically and is present in all parts of the plant (Yaguchi and Takahashi 1984; Li *et al.* 2006; Albrechtsen 2006a).	Yes *Hop stunt viroid* variants have been detected in grapevine, hop, sweet cherry, sour cherry, citrus, plum, peach, apricot; almond, pomegranate, common fig and jujube (Astruc *et al.* 1996; Sano *et al.* 2001; Yakoubi *et al.* 2007; Gazel *et al.* 2008; Zhang *et al.* 2009). The viroid may be transmitted via mechanical means (Sano 2003a), through cuttings and grafting (European Food Safety Authority 2008) or via grape seed (Wan Chow Wah and Symons 1999). Seed transmission was shown not to occur in hop (Yaguchi and Takahashi 1984). It is not pollen transmitted in hop (Yaguchi and Takahashi 1984).	Yes No symptoms of disease have been observed when *Hop stunt viroid* infects grapevine (Little and Rezaian 2003) cherry, apricot, almond, pomegranate and jujube (Sano 2003a; Gazel *et al.* 2008; Zhang *et al.* 2009; Osman *et al.* 2012). However, *Hop stunt viroid* causes diseases in some hosts including hop (Kawaguchi-Ito *et al.* 2009); citrus (Reanwarakorn and Semancik 1999); and plum and peach (Sano 2003a).	Yes (WA)[EP]
VIRUSES						
Alfalfa mosaic virus [Bromoviridae: Alfamovirus]	Yes (CABI-EPPO 2002).	Yes Qld, Vic. (Plant Health Australia 2001a). Recorded from all Australian states/territories (Norton and Johnstone 1998).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Arabis mosaic virus [Secoviridae: Nepovirus]	Yes On grape (NIAS 2012).	Yes Vic. (Sharkey *et al.* 1996). Tas. (Munro 1987). Not known to be present in WA.	Yes This virus is associated with grapevine degeneration or decline (Martelli 2010). Transmitted through seed of a number of species (Murant 1970; CABI-EPPO 1997a). Found in infected weed seeds (Murant 1983).	No Little or no spread. Nematode vectors are absent or have a limited distribution (Moran 1995; Plant Health Australia 2001a; Pethybridge *et al.* 2008).	Assessment not required	No
Broad bean wilt virus 2 [Comoviridae: Fabavirus]	Yes (Kobayashi *et al.* 2004). As Broad bean wilt virus (CABI-EPPO 2004). Probably occurs worldwide (Zhou 2002).	Yes NSW (Schwinghamer *et al.* 2007). May be present in Qld (Plant Health Australia 2001a) but the records could be of *Broad bean wilt virus 1*. Not known to be present in WA.	Yes Recorded in grapevine (CIHEAM 2006). Probably infects systemically.	No At least one strain is transmitted in seed of *Vicia faba* (Zhou 2002) but no record of seed transmission in *Vitis* spp. was found. Transmitted in a non-persistent manner by aphids, including *Myzus persicae*, *Aphis craccivora* and *Acyrthosiphon pisum* (Zhou 2002). No records of acquisition of the virus from infected grape bunches.	Assessment not required	No
Cucumber mosaic virus [Bromoviridae: Cucumovirus]	Yes Worldwide distribution, including on tomato in Japan (Palukaitis *et al.* 1982).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a; CABI 2012).	Assessment not required	Assessment not required	Assessment not required	No

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Grapevine asteroid mosaic-associated virus [Tymoviridae: Marafivirus] Asteroid mosaic	Yes (Nakaune *et al.* 2008a).	No records found	Yes Causes small, star-shaped spots on leaves (Stellmach and Goheen 1988). Probably infects systemically. The virus is limited to the phloem (CIHEAM 2006).	No *Grapevine asteroid mosaic-associated virus* has similarities with grapevine fleck virus and belongs to the grapevine fleck complex (Sabanadzovic *et al.* 2000; CIHEAM 2006; Uyemoto *et al.* 2009). This virus is limited to the phloem and not mechanically transmissible (Boscia *et al.* 1994; Digiaro *et al.* 1999; Martelli *et al.* 2002; CIHEAM 2006). No known vector (Martelli *et al.* 2002; CIHEAM 2006). No reports of seed transmission were found.	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Grapevine berry inner necrosis virus [Flexiviridae: Trichovirus]	Yes (MAFF 2008a; NIAS 2012)	No records found	Yes Infects systemically (Yoshikawa *et al.* 1997). Causes necrosis of grape berries (Terai *et al.* 1993; Martelli *et al.* 2007). Can cause latent infections (Nishijima *et al.* 2000). Analysis of genome organisation, and nucleotide and amino acid sequences indicates that *Grapevine berry inner necrosis* resembles *Apple chlorotic leafspot virus* (Yoshikawa *et al.* 1997).	No The disease spreads naturally in the field (Yoshikawa *et al.* 1997; Nishijima *et al.* 2000). The virus is transmitted by the grape erineum mite *Colomerus vitis* (Kunugi *et al.* 2000). *Colomerus vitis* is present in Japan (JSAE 1987) and in Australia (Plant Health Australia 2001a). However, no association of this mite species with grape bunches was found. It is therefore unlikely that *Grapevine berry inner necrosis* on infested grape bunches will be transmitted to a suitable host via this mite. (Note: Should *Colomerus vitis* be reported as being associated with grape bunches in the future and/or be detected in table grape consignments, it will be treated as a quarantine pest of concern for Australia and the categorisation for this pest will then need to be re-assessed.) *Grapevine berry inner necrosis* is graft- and sap-transmissible (Nishijima *et al.* 2000; Morinaga 2001). No reports of seed transmission found.	Assessment not required	No

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Grapevine fanleaf virus Synonym: *Grapevine yellow mosaic virus* [Secoviridae: Nepovirus]	Yes (MAFF 2008a; NIAS 2012)	Yes NSW ,Vic. and SA (Emmett and Hamilton 1994; Stansbury *et al.* 2000; Habili *et al.* 2001; Plant Health Australia 2001a). Not known to be present in WA.	Yes The virus has been detected in endosperm of grapevine seed (Cory and Hewitt 1968).	Yes The virus has been detected in endosperm of grapevine seed and can occasionally be transmitted to grapevine seedlings (Cory and Hewitt 1968; Lazar *et al.* 1990; Mink 1993). Also transmitted by the nematode *Xiphinema index*, and occasionally by *X. italiae* (Cohn *et al.* 1970; Brunt *et al.* 1996a; Martelli *et al.* 2001). Transmission by *X. vuittenezi* has also been suspected but not proven (CIHEAM 2006). *Xiphinema index*, *X. italiae* and *X. vuittenezi* are not known to be present in WA (Plant Health Australia 2001a; Lantzke 2004; DAWA 2006a). Also transmitted by grafting (Martelli *et al.* 2001).	Yes *Grapevine fanleaf virus* is a significant virus affecting grapevine in many countries (Martelli *et al.* 2001; Andret-Link *et al.* 2004; CIHEAM 2006). Infected fruit are uneven in size, bunches may be straggly with some immature berries interspersed (Andret-Link *et al.* 2004; CIHEAM 2006). Severe symptoms occur, although not exclusively, when *Grapevine fanleaf virus* co-infects with grapevine yellow speckle viroid 1 or 2 (Szychowski *et al.* 1995; Little and Rezaian 2003).	Yes (WA)[EP]
Grapevine fleck virus [Tymoviridae: Maculavirus]	Yes (MAFF 2008a; Nakaune *et al.* 2008a).	Yes (Habili and Symons 2000; Constable and Rodoni 2011) Vic. (Plant Health Australia 2001a). NSW, SA, Qld, WA and Vic. (Constable *et al.* 2010).	Assessment not required	Assessment not required	Assessment not required	No
Grapevine leafroll-associated virus 1 [Closteroviridae: Ampelovirus]	Yes (Nakaune *et al.* 2008a). Grapevine leafroll-associated virus (MAFF 2008a)	Yes (Habili and Symons 2000). NSW, Qld, SA, Vic., WA (Constable *et al.* 2010). Vic. (Plant Health Australia 2001a). WA (Peake *et al.* 2004).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Grapevine leafroll-associated virus 2 [Closteroviridae: Closterovirus]	Yes (Nakaune *et al.* 2008a). Grapevine leafroll-associated virus (MAFF 2008a).	Yes (Habili and Symons 2000). NSW, Qld, SA, Vic., WA (Constable *et al.* 2010). WA (Peake *et al.* 2004).	Assessment not required	Assessment not required	Assessment not required	No
Grapevine leafroll-associated virus 3 [Closteroviridae: Ampelovirus]	Yes (Nakaune *et al.* 2008a). Grapevine leafroll-associated virus (MAFF 2008a).	Yes (Habili and Symons 2000). Vic. (Plant Health Australia 2001a). NSW, Qld, SA, Vic., WA (Constable *et al.* 2010). WA (Peake *et al.* 2004).	Assessment not required	Assessment not required	Assessment not required	No
Grapevine rupestris stem pitting-associated virus [Betaflexiviridae: Foveavirus]	Yes (Nakaune *et al.* 2008a).	Yes (Constable *et al.* 2010). This is the most widespread virus in Australian vineyards (Habili and Symons 2000). Vic., as *Grapevine rupestris stem pitting virus* (Plant Health Australia 2001a). The disorder putatively caused by this virus is extremely widespread (Martelli 2010).	Assessment not required	Assessment not required	Assessment not required	No
Grapevine virus A [Betaflexiviridae: Vitivirus]	Yes (MAFF 2008a).	Yes (Habili and Symons 2000; Constable *et al.* 2010). Vic. (Plant Health Australia 2001a), SA (Habili and Symons 2000) and WA (Habili *et al.* 2009).	Assessment not required	Assessment not required	Assessment not required	No

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Grapevine virus B [Betaflexiviridae: Vitivirus]	Yes (MAFF 2008a; Nakaune *et al.* 2008a).	Yes Vic. and SA, but no symptoms of corky bark recorded (Whattam 2001; Habili 2009). Not known to be present in WA.	Yes Infects systemically (Martelli 1997). Is a phloem-limited virus (Martelli 1997); probably present in fruit.	No Not seed transmitted; transmitted by grafting; transmitted by the mealybugs *Planococcus ficus*, *Pseudococcus longispinus* and *Ps. affinis* (CIHEAM 2006; Martelli 2010). Even though some of these vectors are present in both Japan and Australia, the virus is unlikely to be co-transported with a vector insect or to be transmitted from imported fruit to a suitable host plant given the very low mobility of scales and mealybugs.	Assessment not required	No
Grapevine virus E [Betaflexiviridae: Vitivirus]	Yes (Nakaune *et al.* 2008b).	No records found	Yes Probably present in fruit. Other viruses of the genus *Vitivirus* infect systemically (CIHEAM 2006).	No No report of seed transmission was found. Probably transmitted by grafting, similar to *Grapevine virus A* and *Grapevine virus B*. Laboratory studies show that *Grapevine virus E* can be transmitted by the mealybug *Pseudococcus comstocki* in the presence of *Grapevine leafroll-associated virus 3* (Nakaune *et al.* 2008b). Unlikely to be co-transported with a vector insect or to be transmitted from imported fruit to a suitable host plant.	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tobacco necrosis viruses [Tombusviridae: Necrovirus]	Yes On grapes (MAFF 2008a; NIAS 2012), strawberry roots (Tezuka *et al.* 1974; Kaname 1974; NIAS 2012), tulip (Matsunami *et al.* 1977; NIAS 2012), and tomatoes (Zitikaite and Staniulis 2009; NIAS 2012).	Yes *Tobacco necrosis viruses* have been reported in Qld (Teakle 1988; Plant Health Australia 2001a) and Vic. (Finlay and Teakle 1969; Teakle 1988), but not on grapevine. It is not known if the species or strain that infects grapevine is present in Australia. Not known to be present in WA.	Yes The strain of *Tobacco necrosis virus* found in grapevine in South Africa spreads systemically (Cesati and Van Regenmortel 1969); probably present in grape bunches.	Yes Some TNV strains are established in Australia (Teakle 1988). TNV strains typically have a wide host range (Uyemoto 1981), including grapevine (Zitikaite and Staniulis 2009) and many of these hosts occur in Australia. TNVs are transmitted by *Olpidium* spp. (Rochon *et al.* 2004) and at least one of these vectors occur in Australia (Maccarone *et al.* 2008).	Yes TNVs cause rusty root disease of carrot, Augusta disease of tulip, stipple streak disease of common bean, necrosis diseases of cabbage, cucumber, soybean and zucchini and ABC disease of potato (Uyemoto 1981; Smith *et al.* 1988; Xi *et al.* 2008; Zitikaite and Staniulis 2009).	Yes[EP]
Tobacco ringspot virus [Secoviridae: Nepovirus]	Yes (CABI-EPPO 1997d).	Yes Qld, SA (CABI-EPPO 1997d). Not considered to be present in WA (DAFWA 2013).	Yes This virus is associated with embryonic tissue of the seed of its host plants. Some seed transmission probably occurs in most hosts (Stace-Smith 1985).	Assessment not required This virus was not assessed, as it may be seedborne in capsicum seed (Stace-Smith 1985) for planting that is permitted entry into Western Australia.	Assessment not required	No
Tomato black ring virus [Secoviridae: Nepovirus]	Yes (CABI-EPPO 1997e). *Vitis* spp. are reported as principal hosts of this virus (Card *et al.* 2007). In Japan, the beet ringspot strain of this virus was isolated from *Narcissus* in Shizuoka Prefecture in 1967 (Iwaki and Komuro 1973; NIAS 2012).	No records found	No No records/reports of *Tomato black ring virus* could be found on grapevine in Japan. The only record found of this virus in Japan is the one on *Narcissus* (Iwaki and Komuro 1973). This virus is transmitted between plants by the nematodes *L. attenuatus* and *L. elongatus* (Brown *et al.* 1989; Harrison 1996; CABI-EPPO 1997e). No records/reports of these nematode species could be found for Japan. Harrison (1996) reported that there is no evidence of spread of this virus in Japan. We also found no evidence of any spread of this virus in Japan.	Assessment not required	Assessment not required	No

Pest	Present in Japan	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tomato ringspot virus Synonym: *Tomato ringspot nepovirus* [Secoviridae: Nepovirus] Yellow vein (common name when in grapes)	Yes (CABI-EPPO 1997f). On *Narcissus* spp., *Cucumis* spp. and *Petunia* spp. in Japan (Iwaki and Komuro 1971; NIAS 2013). Grapevine is a host of this virus (CABI-EPPO 1997f). The record of this virus on grapes in Japan (NIAS 2012) was based on detection of this virus on imported grapes (MAFF 2013d).	No Recorded in SA (Chu *et al.* 1983), but there are no further records, the infected plants no longer exist, and the virus is believed to be absent from Australia.	Yes Infects systemically; present in seed of grapevine (Uyemoto 1975; Gonsalves 1988).	Yes Seed transmitted in grapevine occasionally (Uyemoto 1975). Also transmitted by nematodes (*Xiphinema* spp.) and by grafting (Stace-Smith 1984).	Yes *Tomato ringspot virus* causes disease in *Malus pumila* (apple), *Pelargonium* spp. (geranium), *Prunus* spp. (almond, apricot, cherry, nectarine, peach, plum), *Rubus* spp. (blackberry and raspberry), *Fragaria* spp (strawberry), *Solanum lycopersicum* (tomato) and *Vitis* spp. (grapevine) (Brunt *et al.* 1996b; CABI 2011). Most of these species are commercially produced in Australia.	Yes[EP]
Tomato spotted wilt virus [Bunyaviridae: Tospovirus]	Yes (CABI-EPPO 1999). On many different host species in Japan, but not on grape (NIAS 2012).	Yes NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a; Persley *et al.* 2006).	Assessment not required	Assessment not required	Assessment not required	No

Appendix B Additional quarantine pest data

Quarantine pest	***Harmonia axyridis* (Pallas, 1773) [EP]**
Synonyms	*Anatis circe* (Mulsant, 1856) *Coccinella axyridis* (Pallas, 1773) *Coccinella conspicua* (Faldermann, 1835) *Coccinella aulica* (Faldermann, 1835) *Coccinella succinea* (Hope, 1843) *Ptychanatis yedoensis* (Takizawa, 1917)
Common name(s)	Harlequin ladybird, multicoloured Asian ladybird
Main hosts	Predator of soft bodied insects (for example aphids, scales) (Koch 2003; Brown *et al.* 2008b) in a wide range of arboreal (broadleaf and conifer) and herbaceous habitats (Ker and Carter 2004; Koch *et al.* 2006). *Cucurbita moschata* (pumpkin), *Malus domestica* (apple), *Pyrus communis* (pear), *Prunus domestica* (plum), *Prunus persica* (peach), *Rubus* (raspberry) and *Vitis vinifera* (grapevine) (Koch and Galvan 2008; EPPO 2009a).
Distribution	Presence in Australia: No records found. Presence in Japan: Yes (Brown *et al.* 2008b), on all the major islands and several smaller islands (Tadauchi and Inoue 2006). Presence elsewhere: Argentina, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, Chile, China, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, Jersey, Korea, Latvia, Lesotho, Liechtenstein, Luxemburg, Mexico, Netherlands, Norway, Paraguay, Peru, Poland, Portugal, Romania, eastern Russia (Siberia), Serbia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Uruguay, US (Komai and Chino 1969; de Almeida and da Silva 2002; Lucas *et al.* 2002; Koch 2003; Koch *et al.* 2006; Roy and Roy 2008; Brown *et al.* 2008b; Su *et al.* 2009; EPPO 2009a; Brown *et al.* 2011; CABI 2011).
Quarantine pest	***Popillia japonica* Newman, 1838 [EP]**
Synonyms	*Popillia plicatipennis* Burmeister, 1844 Confused with *P. quadriguttata* in Korea (Lee *et al.* 2007).
Common name(s)	Japanese beetle, velvety chafer beetle
Main hosts	*Acer* spp. (maple), *Asparagus officinalis* (asparagus), *Betula populifera* (paper birch), *Glycine max* (soybean), *Hibiscus* spp. (hibiscus), *Juglans nigra* (black walnut), *Malus* spp. (apple), *Platanus acerifolia* (plane tree), *Populus nigra* (black poplar), *Prunus* spp. (stinkwood), *Rheum hybridum* (rhubarb), *Rosa* spp. (roses), *Ulmus* spp. (elm), *Vitis vinifera* (grapevine), *Zea mays* (maize) (Fleming 1972; CABI 2009). Total host range includes over 300 species (Potter and Held 2002).
Distribution	Presence in Australia: No records found. Presence in Japan: On all four main islands (Fleming 1972; Tayutivutikul and Kusigemati 1992; Tadauchi and Inoue 2006), but is more abundant in northern Honshu and in Hokkaido (Fleming 1972). Presence elsewhere: China (CABI-EPPO 1997c; GSAGR 2010), Russian Federation (Kuril Islands, Amurland) (Löbl and Smetana 2006) and the US (Fleming 1972).
Quarantine pest	***Aleurolobus taonabae* (Kuwana, 1911) [EP]**
Synonyms	As *Aleyrodes taonaboe* Kuwana in Li (2004) *Aleyrodes taonabe* (Kuwana) *Aleurolobus chinensis* Takahashi 1936 (Martin and Mound 2007; Lucid 2007)
Common name(s)	Grape whitefly
Main hosts	*Vitis vinifera* (grape), *Crataegus* spp. (hawthorn) (Li 2004), *Mallotus japonicus*, *Ternstroemia japonica* (Takahashi 1954). There are no reports of other host plants.
Distribution	Presence in Australia: No records found. Presence in Japan: Honshu (Tadauchi and Inoue 2006). Presence elsewhere: China (Li 2004), India, Taiwan (Dubey and Ko 2009). Note: AQSIQ (2007b) states that *Aleyrodes taeonabe* Kuwana is not recorded in China due to nomenclature difference.

Quarantine pest	***Crisicoccus matsumotoi* (Siraiwa, 1935) EP**
Synonyms	*Pseudococcus matsumotoi* Siraiwa, 1935 *Pseudococcus astericola* Shinji, 1936
Common name(s)	Matsumoto mealybug
Main hosts	Hosts include *Acer* (maple), *Acer buergerianum* (trident maple), *Acer palmatum* (Japanese maple), *Aster indicus* (aster), *Codiaeum*, *Diospyros kaki* (persimmon), *Juglans regia* (walnut), *Broussonetia kazinoki*, *Ficus* (fig), *Morus alba* (white mulberry), *Malus pumila* (apple), *Pyrus communis* (pear), *Pyrus ussuriensis* (Manchurian pear), *Citrus*, *Camelia sinensis* (tea) (Ben-Dov *et al.* 2012).
Distribution	Presence in Australia: No records found. Presence in Japan: On all four major islands (Shiraiwa 1935). Hokkaido, Niigata, Tokyo, Kanagawa, Shizuoka, Shimane, Okayama, Ehime and Fukuoka Prefectures (Shiraiwa 1935; Ben-Dov *et al.* 2012). Presence elsewhere: India, Philippines, South Korea (Ben-Dov *et al.* 2012).
Quarantine pest	***Planococcus kraunhiae* (Kuwana, 1902) EP**
Synonyms	*Dactylopius kraunhiae* Kuwana, 1902 *Pseudococcus kraunhiae* Fernald, 1903 *Dactylopius krounhiae* Kuwana, 1917 *Planococcus kraunhiae* Ferris, 1950 *Planococcus siakwanensis* Borchsenius, 1962
Common name(s)	Japanese mealybug
Main hosts	Reported on a wide range of plants including *Agave americana* (American aloe), *Casuarina stricta* (drooping sheoak), *Cucurbita moschata* (winter squash), *Diospyros kaki* (persimmon), *Rhododendron indicum* (azalea), *Mallotus japonicus* (food wrapper plant), *Wisteria floribunda* (Japanese wisteria), *Magnolia grandiflora* (southern magnolia), *Broussonetia kazinoki* (kozo), *Ficus carica* (common fig), *Morus alba* (white mulberry), *Musa basjoo* (Japanese banana), *Nandina domestica* (nandina), *Olea chrysophylla* (wild olive), *Platanus orientalis* (oriental plane), *Digitaria sanguinalis* (hairy crabgrass), *Portulaca oleracea* (common purslane), *Cydonia sinensis* (mock Chinese quince), *Pyrus ussuriensis* (Manchurian pear), *Coffea arabica* (arabica coffee), *Gardenia jasminoides* (common gardenia), *Citrus junos* (yuzu), *Citrus nobilis* (tangerine), *Citrus* x *paradisi* (grapefruit) (Ben-Dov 2013b).
Distribution	Presence in Australia: No records found. Presence in Japan: Honshu, Shikoku and Kyushu (Tadauchi and Inoue 2006). Presence elsewhere: China, Philippines; South Korea, Taiwan, US (Miller *et al.* 2005; Ben-Dov 2013b).
Quarantine pest	***Planococcus lilacinus* Cockerell, 1905 EP**
Synonyms	*Pseudococcus tayabanus* Cockerell, 1905 *Dactylopius coffeae* Newstead, 1908 *Pseudococcus coffeae* (Newstead, 1908) *Dactylopius crotonis* Green, 1911 *Pseudococcus crotonis* (Green, 1911) *Pseudococcus deceptor* Betrem, 1937 *Tylococcus mauritiensis* Mamet, 1939 *Planococcus crotonis* (Green, 1911) *Planococcus tayabanus* (Cockerell, 1905) *Planococcus indicus* Arasthi and Shafee, 1987
Common name(s)	Coffee mealybug
Main hosts	The host range of *P. lilacinus* is extremely wide. It attacks over 65 genera of plants in 35 families, including Anacardiaceae, Asteraceae, Euphorbiaceae, Fabaceae, Leguminosae and Rutaceae (Ben-Dov *et al.* 2005). *Planococcus lilacinus* attacks *Annona squamosa* (custard apple), *Coffea* spp. (coffee), *Citrus* (citrus), *Mangifera indica* (mango), *Psidium guajava* (guava), *Solanum tuberosum* (potato), *Tamarindus indica* (tamarind), *Theobroma cacao* (cocoa) and *Vitis* spp. (grapes) (Tandon and Verghese 1987; Ben-Dov *et al.* 2005; MacLeod 2006), and other tropical and sub-tropical fruits and shade trees (CABI 1995).

Distribution	Presence in Australia: No records found. Presence in Japan: Okinawa, Islands of Miyako, Ishigaki and Iriomote (Tadauchi and Inoue 2006). Presence elsewhere: *P. lilacinus* occurs mainly in the Palaearctic, Malaysian, Oriental, Australasian and Neotropical regions, and is the dominant cocoa mealybug in Sri Lanka and Java (Entwistle 1972). Williams (1982) reported that the species was probably introduced into the South Pacific from Southern Asia. In Asia, *P. lilacinus* is recorded from Bangladesh, Brunei Darussalam, Cambodia, Cocos Islands, India, Indonesia, Japan, Laos, Malaysia, Maldives, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam and Yemen (CABI 2013).
Quarantine pest	***Pseudococcus comstocki* (Kuwana, 1902) [EP]**
Synonyms	*Dactylopius comstocki* Kuwana, 1902
Common name(s)	Comstock's mealybug
Main hosts	*Acer*, *Aesculus* spp. (horse chestnut), *Aglaia odorata* (Chinese perfume tree), *Alnus japonica* (Japanese alder), *Amaryllis vittata*, *Artemisia*, *Buxus microphylla* (littleleaf boxwood), *Camellia japonica* (camellia), *Castanea* (chestnut), *Catalpa* (northern catalpa), *Celtis willdenowiana* (enoki), *Cinnamomum camphorae* (camphor tree), *Citrus* (citrus), *Crassula tetragona* (miniature pine tree), *Cydonia oblonga* (quince), *Cydonia sinensis* (Chinese quince), *Deutzia parviflora typical* (gaura), *Dieffenbachia picta* (dumb cane), *Erythrina indica* (rainbow eucalyptus), *Euonymus alatus* (winged euonymus), *Fatsia japonica* (Japanese aralia), *Ficus carica* (fig), *Fiwa japonica*, *Forsythia koreana* (forsythia), *Gardenia jasminoides* (gardenia), *Ginkgo biloba* (ginkgo), *Hydrangea* (hydrangea), *Ilex cornuta* (Chinese holly), *Ilex crenata microphylla* (Korean gem), *Kraunhia*, *Lagerstroemia indica* (crepe myrtle), *Ligustrum ibota angustifolium*, *Lonicera* (honeysuckle), *Loranthus* (mistletoe), *Malus pumila* (paradise apple), *Malus sylvestris* (crab apple), *Masakia japonica* (Japanese euonymus), *Monstera deliciosa* (monstera), *Morus alba* (white mulberry), *Morus kagayamae* (mulberry), *Musa* (bananas), *Nephelium lappaceum* (rambutan), *Opuntia dillenii* (prickly pear), *Orixa japonica* (Japanese orixa), *Pandanus* (screwpines), *Persica vulgaris* (peach), *Pinus thunbergiana* (Japanese black pine), *Populus* (poplar), *Prunus mume* (Japanese apricot), *Punica granatum* (pomegranate), *Pyrus communis* (European pear), *Pyrus serotina culta* (black cherry), *Rhamnus* (buckthorn), *Rhododendron mucronulatum* (Korean Rhododendron), *Sasamorpha* (bamboo), *Taxus* (yew), *Torreya nucifera* (Japanese torreya), *Trema orientalis* (nalita), *Viburnum awabucki* (acacia confuse), *Zinnia elegans* (zinnia) (Ben-Dov 2012c).
Distribution	Presence in Australia: No records found. Presence in Japan: Yes (JSAE 1987; MAFF 1989a; MAFF 1990a; MAFF 2008a; Ben-Dov 2012c). Honshu, Kyushu, Shikoku (CABI 1989; Tadauchi and Inoue 2006). Presence elsewhere: Afghanistan, Argentina, Armenia, Azerbaijan, Brazil, Canada, Canary Islands, China, Columbia, Federated States of Micronesia, Indonesia, Iran, Italy, Kampuchea, Kazakhstan, Kyrgyzstan, Madeira Islands, Malaysia, Mexico, Moldova, Northern Mariana Islands, Russia, Saint Helena, South Korea, Sri Lanka, Tajikistan, Turkmenistan, US, Uzbekistan, Vietnam (CABI 2009; Ben-Dov 2012c).
Quarantine pest	***Daktulosphaira vitifoliae* (Fitch, 1855) [EP]**
Synonyms	*Viteus vitifolii* (Fitch, 1855) *Phylloxera vastatrix* Planchon, 1874 *Phylloxera vitifoliae* (Fitch, 1855)
Common name(s)	Grapevine phylloxera, vine louse
Main hosts	The principal economic hosts are *Vitis* spp.
Distribution	Presence in Australia: Is under official control and restricted to parts of NSW and Vic. (Loch and Slack 2007; PGIBSA 2009). Presence in Japan: On Honshu (Tadauchi and Inoue 2006). Presence elsewhere: Algeria, Argentina, Armenia, Austria, Azerbaijan, Bermuda, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, China, Colombia, Croatia, Czech Republic, EU, France, Georgia, Germany, Greece (but not Crete), Hungary, India, Israel, Italy, Jordan, Korea Democratic People's Republic, Korea Republic, Lebanon, Luxembourg, Macedonia, Malta, Mexico, Moldova, Morocco, New Zealand, Panama, Peru, Portugal, Romania, Russia (southern), Slovakia, Slovenia, South Africa, Spain, Switzerland, Syria, Turkey, Tunisia, Ukraine, United Kingdom, US, Uruguay, Venezuela, Yugoslavia (former), Zimbabwe (CABI 2009).

Quarantine pest	***Parthenolecanium corni* (Bouché, 1844) [EP, WA]**
Synonyms	*Coccus rosarum* Snellen van Volenhoven 1862, *C. tiliae* Fitch 1851, *Eulecanium corni corni* (Bouché), *E. fraxini* King 1902, *E. guignardi* King 1901, *E. kansasense* (Hunter) King 1901, *E. rosae* King 1901, *E. vini* (Bouché) Cockerell 1901, *Lecanium* (*Eulecanium*) *armeniacum* Craw; Cockerell & Parrott 1899, *L. (E.) assimile* Newstead; Reh 1903, *L. (E.) aurantiacum* Hunter 1900, *L. (E.) canadense* Cockerell; Cockerell & Parrott 1899, *L. (E.) caryarum* Cockerell 1898, *L. (E.) corylifex* Fitch; Cockerell 1896, *L. (E.) crawii* Ehrhorn Cockerell & Parrott 1899, *L. (E.) cynosbati* Fitch, Cockerell & Parrott 1899, *L. (E.) fitchii* Cockerell & Parrott 1899, *L. (E.) kingii* Cockerell 1898, *L. (E.) lintneri* Cockerell & Bennett; Cockerell 1895, *L. (E.) maclurarum* Cockerell 1898, *L. (E.) ribis* Fitch; Cockerell & Parrott 1899, *L. (E.) rugosum* Signoret; Cockerell 1896, *L. (E.) rugosum* Signoret; Cockerell 1896, *L. (E.) vini* Bouché, King & Reh 1901, *L. adenostomae* Kuwana 1901, *L. armeniacum* Craw 1891, *L. assimile* Newstead 1892, *L. canadense* Cockerell; Cockerell 1899, *L. caryae canadense* Cockerell 1895, *L. corni* Bouché 1844, *L. corni robiniarum* Marchal 1908, *L. coryli* (Linnaeus) Sulc 1908 (misidentification), *L. corylifex* Fitch 1857, *L. crawii* Ehrhorn 1898, *L. cynosbati* Fitch 1857, *L. fitchii* Signoret 1872, *L. folsomi* King 1903, *L. juglandifex* Fitch 1857, *L. kansasense* Hunter 1899, *L. lintneri* Cockerell & Bennett in Cockerell 1895, *L. maclurae* Hunter 1899, *L. obtusum* Thro 1903, *L. persicae crudum* Green 1917, *L. pruinosum armeniacum* Craw; Tyrell 1896, *L. rehi* King in King & Reh 1901, *L. ribis* Fitch 1857, *L. robiniarum* Douglas 1890, *L. rugosum* Signoret1873, *L. tarsalis* Signoret 1873, *L. vini* Bouché 1851, *L. websteri* King 1902, *L. wistariae* Signoret 1873, *Parthenolecanium corni* (Bouché); Borchsenius 1957, *P. coryli* (Linnaeus); Sulc 1908 (misidentification).
Common name(s)	European fruit lecanium
Main hosts	*Parthenolecanium corni* is highly polyphagous, attacking some 350 plant species placed in 40 families. It attacks a wide range of crops, mostly woody fruit trees and ornamentals. Primary hosts are: *Crataegus* (hawthorn), *Malus* (ornamental species apple), *Prunus domestica* (damson plum), *Prunus persica* (peach), *Ribes nigrum* (blackcurrant), *Ribes rubrum* (red currant), *Rosa* (roses), *Vitis vinifera* (grapevine) (CABI 2011).
Distribution	Presence in Australia: Vic. and Tas. (Plant Health Australia 2001a; CSIRO 2005). Presence in Japan: Hokkaido, Honshu and Shikoku (Tadauchi and Inoue 2006). Presence elsewhere: Afghanistan, Albania, Algeria, Argentina, Armenia, Austria, Azerbaijan, Belgium, Brazil, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Egypt, Finland, France, Georgia, Germany, Greece, Hungary, India, Iran, Italy, Kazakhstan, Korea (North), Korea (South), Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Malta, Mexico, Moldova, Mongolia, Netherlands, New Zealand, Norway, Pakistan, Peru, Poland, Portugal, Romania, Russian Federation, Serbia/Montenegro, Slovakia, Spain, Sweden, Switzerland, Syria, Tajikistan, Turkey, Turkmenistan, Ukraine, United Kingdom, US, Uzbekistan, Yugoslavia (former) (CABI 2011).
Quarantine pest	***Eupoecilia ambiguella* (Hübner, 1796) [EP]**
Synonyms	*Clysia ambiguella* Hübner, 1796 *Clysiana ambiguella* Hübner *Cochylis ambiguella* Hübner, 1879 *Conchylis ambiguella* Hübner, 1796 *Tinea ambiguella* Hübner, 1796
Common name(s)	Grape moth, grape berry moth, grapevine moth, grape bud moth, vine moth
Main hosts	*Ampelopsis* (Virginia creeper), *Fraxinus* (ash), *Galium* (yellow bedstraw), *Prunus domestica* (plum), *Prunus salicina* (Japanese plum), *Prunus spinosa* (blackthorn), *Ribes nigrum* (blackcurrant), *Viburnum lantana*, *Vitis vinifera* (grapevine) (CABI 2009; INRA 2009).
Distribution	Presence in Australia: No records found. Presence in Japan: Hokkaido, Honshu, Shikoku, Kyushu, Tsushima island, Izu island (Tadauchi and Inoue 2006). Presence elsewhere: Armenia, Austria, Azerbaijan, Belgium, Brazil, Bulgaria, China, Czechoslovakia, Denmark, England, Finland, France, Georgia, Germany, Hungary, India, Italy, Kazakhstan, Kyrgyzstan, Latvia, Luxembourg, Moldova, Montenegro, Norway, Pakistan, Poland, Portugal, Romania, Russia, Serbia, Spain, Switzerland, Ukraine, Uzbekistan (CABI 2009; Frolov 2009a).
Quarantine pest	***Sparganothis pilleriana* (Denis & Schiffermuller 1775) [EP]**
Synonyms	*Oenophthira pilleriana* Denis & Schiffermuller, 1775 *Tortrix pilleriana* (Denis & Schiffermuller, 1775)
Common name(s)	Grapevine leaf roller, leaf rolling tortrix, grape berry moth

Main hosts	*Abies sachalinensis*, *Beta vulgaris* (beet), *Camellia* (tea), *Castanea*, *Centaurea*, *Citrus*, *Clematis*, *Crataegus*, *Disporum smilacinum*, *Eucalyptus* sp., *Fragaria* (strawberry), *Glycine max* (soy bean), *Helianthus annuus* (sunflower), *Humulus*, *Iris*, *Limonium vulgare*, *Lespedeza thunbergia*, *Malus* (apple), *Malus pumila*, *Medicago sativa* (alfalfa), *Narthecium*, *Origanum*, *Phaseolus vulgaris* (green bean), *Pinus* spp. (pine), *Plantago*, *Pteridium aquilinum*, *Prunus* spp (plum, apricot, cherry), *Pyrus* (pear), *Quercus* sp., *Robina*, *Rosa* sp. (rose), *Sambucus nigra* (common elder), *Solanum tuberosum* (potato), *Stachys*, *Salix repens*, *Trifolium* sp. (clover), *Vitis vinifera* (grapes), *Wisteria brachybotrys, Zea mays* (maize) (Carter 1984; Zhang 1994; Meijerman and Ulenberg 2000c; INRA 2005; Frolov 2009b).
Distribution	Presence in Australia: No records found. Presence in Japan: Hokkaido, Honshu and Shikoku (Tadauchi and Inoue 2006). Presence elsewhere: Middle and southern areas of the European part of the former USSR, North Caucasus, Transcaucasia, Ural, Kazakhstan, the south of Siberia, Amur Region, Primorskii Territory, southern Kuril Islands, Kamchatka. It is also distributed throughout Western Europe (northward to Sweden), North Africa, Asia Minor, Iran, Iraq, Mongolia, China, Korea, North and Central America (Zhang 1994; Frolov 2009b).
Quarantine pest	***Nippoptilia vitis* (Sasaki, 1913) [EP]**
Synonyms	*Stenoptilia vitis* Sasaki (Anonymous 1935)
Common name(s)	Grape plume moth, small grape plume moth
Main hosts	*Vitis vinifera* (Zhang 2005)
Distribution	Presence in Australia: No records found. Presence in Japan: Honshu, Shikoku and Kyushu, Tsushima island (Tadauchi and Inoue 2006). Presence elsewhere: China and Taiwan (Zheng *et al.* 1993; Wu and Li 1998; Li 2004; Zhang 2005; AQSIQ 2006a; AQSIQ 2007b); Korea (Republic of) (NPQS 2007a).
Quarantine pest	***Platyptilia ignifera* Meyrick, 1908**
Synonyms	None
Common name(s)	Large grape plume moth
Main hosts	*Vitis* spp. (Yano 1963b; Zhang 1994).
Distribution	Presence in Australia: No records found. Presence in Japan: Yes (JSAE 1987; Zhang 1994; MAFF 2008a), Honshu and Kyushu (Tadauchi and Inoue 2006). Presence elsewhere: Taiwan (Zhang 1994) and India (Sidhu *et al.* 2010).
Quarantine pest	***Stathmopoda auriferella* (Walker, 1864) [EP]**
Synonyms	*Gelechia auriferella* Walker, 1864 *Stathmopoda adulatrix* Meyrick, 1917 *Stathmopoda theoris* Meyrick, 1906
Common name(s)	Apple heliodinid
Main hosts	The larvae feed on the fruit, flowers and leaves of *Citrus unshiu* Marcow (unshu mandarin) in Japan (MAFF 1990a). Other hosts include: *Acacia nilotica* (babul) (Robinson *et al.* 2007), *Actinidia deliciosa* (kiwifruit) (Yamazaki and Sugiura 2003), *Albizia altissima* (Sonoran desert) (Robinson *et al.* 2007), *Citrus reticulata* (mandarin) (Yamazaki and Sugiura 2003), *Citrus sinensis* (navel orange) (CABI 2009), *Cocos nucifera* (coconut palm), *Coffea canephora* (coffee), *Coffea liberica* (liberica coffee), *Helianthus annuus* (sunflower) (Yamazaki and Sugiura 2003), *Kerria communis* (lac scale) (Robinson *et al.* 2007), *Malus pumila* var. *domestica* (fuji apple) (AQIS 1998), *Mangifera indica* (mango) (CABI 2009); *Persea* spp. (avocado) (Yamazaki and Sugiura 2003), *Nephelium ophiodes*, *Pinus roxburghii* (chir pine), *Prunus salicina*, *Prunus persica* (peach), *Prunus persica* var. *nucipersica* (nectarine), *Punica granatum* (pomegranate) (Yamazaki and Sugiura 2003), *Sorghum bicolor* (sorghum), *Tistania* sp. (Robinson *et al.* 2007), *Vitis vinifera* (table grape) (Yamazaki and Sugiura 2003).
Distribution	Presence in Australia: No records found. Presence in Japan: Honshu, Shikoku, Kyushu, Yakushima Island and Okinawa (Tadauchi and Inoue 2006), Osaka City (Honshu) (Yamazaki and Sugiura 2003). Presence elsewhere: China (Hiramatsu *et al.* 2001; Shanghai Insects Online 2009); Egypt (Badr *et al.* 1983); Greece (Nel and Nel 2003); India (Robinson *et al.* 2007); Indonesia (Java) (EPPO 2010), Korea (Republic of) (Park *et al.* 1994); Malaysia, Pakistan, Philippines, Seychelles, Sri Lanka, Thailand (Robinson *et al.* 2007), Russia (Far East) (EPPO 2010).

Quarantine pest	***Tetranychus kanzawai* Kishida, 1927** [EP, WA]
Synonyms	*Tetranychus hydrangeae* Pritchard & Baker, 1955
Common name(s)	Kanzawa spider mite, tea red spider mite, hydrangea spider mite (CSIRO 2005; CABI 2009)
Main hosts	*Arachis hypogaea* (groundnut), *Camellia sinensis* (tea), *Carica papaya* (papaw), *Citrus* (citrus), *Fragaria* × *ananassa* (strawberry), *Glycine max* (soybean), *Hydrangea* (hydrangea), *Humulus lupulus* (hop), *Malus domestica* (apple), *Morus alba* (mora), *Prunus avium* (sweet cherry), *Prunus persica* (peach), *Pyrus communis* (pear), *Solanum melongena* (aubergine), *Vitis vinifera* (grapevine) (CABI 2009).
Distribution	Presence in Australia: NSW, Qld (Gutierrez and Schicha 1983). Presence in Japan: Widely distributed. Has been recorded in all four main islands, Hokkaido, Honshu, Kyushu and Skikoku (CABI 2012), as well as in Sakishima (Ohno *et al.* 2009), Tanegashima (Takafuji *et al.* 2001) and Yakushima (Takafuji *et al.* 2001). Presence elsewhere: *Tetranychus kanzawai* has been reported from a variety of environments including North America (Mexico), Africa (South Africa), Asia (China, India, Japan, Korea, Thailand, Indonesia) and Oceania (Australia, Papua New Guinea) (Migeon and Dorkeld 2006; CABI 2009).
Quarantine pest	***Drepanothrips reuteri* Uzel, 1895** [EP]
Synonyms	*Drepanothrips viticola* Mokvzechi
Common name(s)	Grape thrips
Main hosts	*Vitis* spp., *Quercus*, *Betula* and *Corylus* (Mound and Palmer 1981).
Distribution	Presence in Australia: No records found. Presence in Japan: On Honshu (Tadauchi and Inoue 2006). Higashi Osaka City (Mound and Palmer 1981). Presence elsewhere: Algeria, Chile, England, France, Greece, Italy, Latvia, US (California) (Mound and Palmer 1981).
Quarantine pest	***Frankliniella occidentalis* (Pergande, 1895)** [EP, NT]
Synonyms	*Euthrips helianthi* Moulton, 1911 *Euthrips tritici californicus* Moulton, 1911 *Frankliniella chrysanthemi* Kurosawa, 1941 *Frankliniella canadensis* Morgan, 1925 *Frankliniella claripennis* Morgan, 1925 *Frankliniella conspicua* Moulton, 1936 *Frankliniella dahliae* Moulton, 1948 *Frankliniella dianthi* Moulton, 1948 *Frankliniella nubila* Treherne, 1924 *Frankliniella occidentalis brunnescens* Priesner, 1932 *Frankliniella occidentalis dubia* Priesner, 1932 *Frankliniella syringae* Moulton, 1948 *Frankliniella trehernei* Morgan, 1925 *Frankliniella tritici maculata* Priesner, 1925 *Frankliniella tritici moultoni* Hood, 1914 *Frankliniella umbrosa* Moulton, 1948 *Frankliniella venusta* Moulton, 1936
Common name(s)	Western flower thrips

Main hosts	*Allium cepa* (onion), *Amaranthus palmeri* (Palmer amaranth), *Arachis hypogaea* (groundnut), *Begonia*, *Beta vulgaris* (beetroot), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Brassica oleracea* var. *capitata* (cabbage), *Capsicum annuum* (capsicum), *Carthamus tinctorius* (safflower), *Chrysanthemum morifolium* (chrysanthemum), *Citrus* x *paradisi* (grapefruit), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita maxima* (giant pumpkin), *Cucurbita pepo* (ornamental gourd), *Cyclamen*, *Dahlia*, *Daucus carota* (carrot), *Dianthus caryophyllus* (carnation), *Euphorbia pulcherrima* (poinsettia), *Ficus carica* (fig), *Fragaria* × *ananassa* (strawberry), *Fuchsia*, *Geranium* (cranesbill), *Gerbera jamesonii* (African daisy), *Gladiolus hybrids* (sword lily), *Gossypium* (cotton), *Gypsophila* (baby's breath), *Hibiscus* (rosemallows), *Impatiens* (balsam), *Kalanchoe*, *Lactuca sativa* (lettuce), *Lathyrus odoratus* (sweet pea), *Leucaena leucocephala* (leucaena), *Limonium sinuatum* (sea pink), *Lisianthus*, *Malus domestica* (apple), *Medicago sativa* (lucerne), *Orchidaceae* (orchids), *Petroselinum crispum* (parsley), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Prunus armeniaca* (apricot), *Prunus domestica* (plum), *Prunus persica* (peach), *Prunus persica* var. *nucipersica* (nectarine), *Purshia tridentata* (bitterbrush), *Raphanus raphanistrum* (wild radish), *Rhododendron* (azalea), *Rosa* (roses), *Saintpaulia ionantha* (African violet), *Salvia* (sage), *Secale cereale* (rye), *Sinapis arvensis* (wild mustard), *Sinningia speciosa* (gloxinia), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Sonchus* (sowthistle), *Syzygium jambos* (rose apple), *Trifolium* (clovers), *Triticum aestivum* (wheat), *Vitis vinifera* (grapevine) (CABI 2009).
Distribution	Presence in Australia: NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2001a). Presence in Japan: Hokkaido, Honshu and Kyushu (CABI 2013). Presence elsewhere: Albania, Algeria, Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Estonia, Finland, France, Germany, Greece, Guana, Guatemala, Hungary, Ireland, Israel, Kenya, Korea (Republic), Kuwait, Lithuania, Macedonia, Malaysia, Malta, Martinique, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Puerto Rico, Romania, Russia, Serbia/Montenegro, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Turkey, United Kingdom, US, Uruguay, Venezuela, Zimbabwe (CABI 2009).
Quarantine pest	***Xylophilus ampelinus* (Panagopoulos 1969) Willems, Gillis, Kersters, Van den Broecke, & De Ley 1987**
Synonyms	*Xanthomonas ampelina* Panagopoulos 1969
Common name(s)	Bacterial blight of grapevine
Main hosts	*Vitis* spp. (Panagopoulos 1988; Bradbury 1991; Szegedi and Civerolo 2011)
Distribution	Presence in Australia: No records found. Presence in Japan: Hokkaido (NIAS 2012; Hokkaido Plant Protection Office 2013). Presence elsewhere: France, Greece, Italy, Moldova, Portugal, Slovenia, South Africa, Spain, Turkey (Panagopoulos 1988; CABI-EPPO 1997b). Probably also occurs in Argentina, Austria, Bulgaria, Canary Islands, Switzerland and Tunisia (Panagopoulos 1988).
Quarantine pest	***Diaporthe melonis* var. *brevistylospora* Ts. Kobay. & Tak. Ohsawa**
Synonyms	*Phomopsis brevistylospora* Ts. Kobay. & Tak. Ohsawa
Common name(s)	Berry drop
Main hosts	*Vitis* spp. (grapevine) (Kinugawa *et al.* 2008), *Cucumis melo* L. (melon) (Ohsawa and Kobayashi 1989)
Distribution	Presence in Australia: No records found. Presence in Japan: Kagawa (Kinugawa *et al.* 2008), Shizuoka (Ohsawa and Kobayashi 1989). Presence elsewhere: China (Jiang *et al.* 2007).
Quarantine pest	***Greeneria uvicola* (Berkley & M.A. Curtis) Punithalingam [WA]**
Synonyms	*Melanconium fuligineum* (Scribn. & Viala) Cavara, *Phoma uvicola* Berk. & M.A. Curtis, *Phyllostictina uvicola* (Berk. & M.A. Curtis) Höhn., *Myrothecium convexum* Berk. & M.A. Curtis, *Greeneria fuliginea* Scribn. & Viala, *Frankiella viticola* Speschnew, *Phyllosticta frankiana* Sacc. & P. Syd.
Common name(s)	Bitter rot
Main hosts	The primary host is *Vitis rotundifolia*, but other *Vitis* spp. are also susceptible, including *V. vinifera*, *V. bourquina*, *V. labrusca* and *V. munsoniana* (Ridings and Clayton 1970; Farr *et al.* 2001; Longland and Sutton 2008).

Distribution	Presence in Australia: NSW, Qld (Castillo-Pando *et al.* 1999; Castillo-Pando *et al.* 2001; Sergeeva *et al.* 2001; Plant Health Australia 2001a). Presence in Japan: Yes (McGrew 1988; MAFF 1989b; NIAS 2013), Kobe city (Hyogo prefecture) (Gohda *et al.* 1976). Presence elsewhere: Brazil, Bulgaria, Costa Rica, Cuba, Greece, India, Mexico, New Zealand, Poland, South Africa, Taiwan, Thailand, Ukraine, Uruguay, eastern US (Sutton and Gibson 1977; McGrew 1988; Farr and Rossman 2013b).
Quarantine pest	***Guignardia bidwellii*** **(Ellis) Viala & Ravaz** [EP]
Synonyms	*Phyllosticta ampelicida* (Engelm.) Aa, *Phoma uvicola* Berk. & M.A. Curtis, *Naemospora ampelicida* Englem., *Phoma ustulata* Berk. & M.A. Curtis, *Depazea labruscae* Englem., *Phoma uvicola* var. *labruscae* Thüm, *Phyllosticta viticola* Thüm, *Septoria viticola* Berk. & M.A. Curtis, *Sacidium viticolum* Cooke, *Phyllosticta ampelopsidis* Ellis & Martin, *Phyllosticta vulpinae* Allesch., *Phyllostictina uvicola* (Berk. & M.A. Curtis) Hohn., *Phyllostictina clemensae* Petr., *Phyllostictina viticola* (Berk. & M.A. Curtis) Petr., *Sphaeria bidwellii* Ellis, *Laestadia bidwellii* (Ellis) Viala & Ravaz, *Physalospora bidwellii* (Ellis) Sacc., *Carlia bidwellii* (Ellis) Prunet, *Botryosphaeria bidwellii* (Ellis) Petr. (CABI 2009; Farr and Rossman 2012).
Common name(s)	Black rot
Main hosts	*Ampelopsis* (wild grape), *Asplenium nidus* (bird's nest fern), *Cissus* (ornamental vine), *Citrus* (citrus), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis arizonica* (canyon grape), *Vitis labrusca* (fox grape), *Vitis vinifera* (grapevine) (CABI 2009).
Distribution	Presence in Australia: No records found. Presence in Japan: Shizuoka, Okayama and Yamaguchi (Kobayashi 2007). Presence elsewhere: Argentina, Austria, Barbados, Brazil, Bulgaria, Canada, Chile, China, Cuba, Cyprus, El Salvador, France, Germany, Guyana, Haiti, India, Iran, Italy, Jamaica, Korea, Martinique, Mexico, Morocco, Mozambique, Pakistan, Panama, Philippines, Romania, Russian Federation, Slovakia, Sudan, Switzerland, Turkey, Ukraine, Virgin Islands (US), Uruguay, US, Venezuela, Yugoslavia (former) (CABI 2009).
Quarantine pest	***Monilia polystroma*** **G. van Leeuwen *et al.***
Synonyms	*Monilia polystroma* is a newly recognised species. Some Japanese isolates formerly described as *Monilinia fructigena* were identified as a distinct species—*Monilia polystroma*—in 2002 (van Leeuwen *et al.* 2002).
Common name(s)	Asiatic brown rot
Main hosts	*Cydonia, Malus*, *Prunus* and *Pyrus* (van Leeuwen *et al.* 2002; Petróczy and Palkovics 2009; Zhu and Guo 2010; CABI 2013).
Distribution	Presence in Australia: No records found. Presence in Japan: To date, *Monilia polystroma* has only been isolated from apple in Japan (van Leeuwen *et al.* 2002). However, reports in Japan previously considered to be *Monilia fructigena*, the anamorph state of *Monilinia fructigena*, probably refer to *Monilia polystroma* (Farr and Rossman 2012; Cline 2012). Presence elsewhere: China (Zhu and Guo 2010; Zhu *et al.* 2011), Czech Republic (EPPO 2011a), Hungary (Petróczy and Palkovics 2009; Petróczy *et al.* 2012), Switzerland (Hilber-Bodmer *et al.* 2012).
Quarantine pest	***Monilinia fructigena*** **(Aderh. & Ruhland) Honey** [EP]
Synonyms	*Monilia fructigena* Pers.: Fr., *Sclerotinia fructigena* (J. Schröt.) Norton, *Sclerotinia fructigena* Aderh, *Stromatinia fructigena* (J. Schröt.) Boud (Ma 2006; CABI 2009; Farr and Rossman 2013b).
Common name(s)	Brown rot
Main hosts	*Amelanchier canadensis* (thicket serviceberry), *Berberis* (barberries), *Capsicum* (peppers), *Cornus mas* (cornelian cherry), *Corylus avellana* (hazel), *Cotoneaster*, *Crataegus laevigata*, *Cydonia oblonga* (quince), *Diospyros kaki* (persimmon), *Eriobotrya japonica* (loquat), *Ficus carica* (fig), *Fragaria* spp., *Solanum lycopersicum* (tomato), *Malus domestica* (apple), *Mespilus germanica* (medlar), *Prunus* spp. (stone fruit), *Psidium guajava* (guava), *Pyrus* spp. (pears), *Rhododendron* (Azalea), *Rosa* (roses), *Rubus* spp. (blackberry, raspberry), *Sorbus*, *Vaccinium* (blueberries), *Vitis vinifera* (grapevine) (Ma 2006; CABI 2009).

Distribution	Presence in Australia: No records found. Presence in Japan: On Hokkaido and Honshu (Aomori, Iwate, Fukushima, Kyoto and Osaka prefectures) (Kobayashi 2007). Presence elsewhere: Afghanistan, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Georgia, Germany, Greece, Hungary, India, Iran, Ireland, Israel, Italy, Kazakhstan, Latvia, Lebanon, Lithuania, Luxembourg, Moldova, Morocco, Nepal, Netherlands, North Korea, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, Uzbekistan, Yugoslavia (former) (CABI 2011).
Quarantine pest	***Pestalotiopsis menezesiana*** **(Bres. & Torr.) Bissett** [WA]
Synonyms	*Pestalotia menezesiana* Bres. & Torrend
Common name(s)	None
Main hosts	*Actinidia chinensis* (kiwifruit) (Park *et al.* 1997), *Cissus rhombifolia* (grape-ivy) (Bissett 1982), *Musa paradisiaca* (plantain) (Huang *et al.* 2007) and *Vitis vinifera* (grapevine) (Mishra *et al.* 1974; Xu *et al.* 1999). Was also isolated from leaves of *Ananas comosus* (pineapple) (Watanabe and Tsudome 1970) and *Leea* spp. (Mundkur and Kheswalla 1942). Further reports include *Actinidia deliciosa* (kiwifruit), *Camellia sinensis* (tea), *Duabanga grandiflora*, *Elaeis guineensis* (oil palm), *Parthenocissus tricuspidata* (Boston ivy), *Podocarpus macrophyllus* (big-leaf podocarp), *Ravenala madagascariensis*, *Rhododendron stamineum* (traveler's-palm) (Farr and Rossman 2013b).
Distribution	Presence in Australia: NSW (Plant Health Australia 2001a; Sergeeva *et al.* 2005). Presence in Japan: Mie, Nara, Niigata, Okayama, Okinawa, Osaka, Shimane, Tottori and Yamanashi prefectures (Watanabe and Tsudome 1970; Xu *et al.* 1999; Kobayashi 2007). Presence elsewhere: Brazil, Canada, China, India, Korea, Madeira Islands, Portugal (Guba 1961; Mishra *et al.* 1974; Bissett 1982; Tomaz and Rego 1990; Park *et al.* 1997; Huang *et al.* 2007).
Quarantine pest	***Pestalotiopsis uvicola*** **(Speg.) Bissett** [WA]
Synonyms	*Pestalotia uvicola* Speg.; *Pestalotia gaurae* Guba
Common name(s)	Fruit rot, berry rot, leaf spot
Main hosts	*Ceratonia siliqua* (carob)(Carrieri *et al.* 2013), *Laurus nobilis* (bay laurel) (Vitale and Polizzi 2005), *Mangifera indica* (mango) (Ismail *et al.* 2013), *Metrosideros kermadecensis* (Kermandac pohutukawa) (Grasso and Granata 2008), *Vitis coignetia*, *V. indivisa*, *V. labrusca* and V. vinifera (grapevine) (Guba 1961; Xu *et al.* 1999; Kobayashi 2007; Farr and Rossman 2013b). Further reports include *Carya illinoensis* (pecan), *Cycas revoluta* (sago cycas), *Gaura parviflora*, *Macademia integrifolia* (macademia nut), *Mahonia acanthifolia* (Farr and Rossman 2013b).
Distribution	Presence in Australia: NSW, Qld (Plant Health Australia 2001b; Sergeeva *et al.* 2005). Presence in Japan: Tokyo-Hachijojima and Tokyo-Oshima islands, and Osaka, Nara, Okayama and Hiroshima prefectures (Kobayashi 2007). Presence elsewhere: Brazil, China, France, India, Italy, Korea, US (Guba 1961; Farr and Rossman 2013b).
Quarantine pest	***Phakopsora euvitis*** **Y. Ono** [EP]
Synonyms	*Aecidium meliosmae-myrianthae* Henn. & Shirae, *Phakopsora ampelopsidis* pro parte, *Physopella ampelopsidis* pro parte, *Physopella vialae* (Lagerh.) Buriticá & J.F. Hennen, *Physopella vitis* (Thüm.) Arthur, *Uredo vialae* Largerh, *Uredo vitis* Thüm
Common name(s)	Grape rust fungus, grapevine rust
Main hosts	*Meliosma* spp., *Cissus* spp. and *Vitis* spp. (grapevine) (Farr and Rossman 2013b). *On Vitis* spp., mainly on *V. labrusca* and *V. vinifera*, but also *V. amurensis*, *V. coignetiae*, *V. ficifolia*, *V. flexuosa* (Ono 2000). *Phakopsora euvitis* is a heteroecious rust (Weinert *et al.* 2003). Pycnidia and aecia have only been observed in Japan on *Meliosma myriantha*. In most other areas, only uredia and telia are produced.
Distribution	Presence in Australia: Recorded in NT in 2001 (Plant Health Australia 2001a; Weinert *et al.* 2003) but has since been eradicated (EPPO 2007; DAFF 2009). Presence in Japan: Yes (Ono 2000; CABI-EPPO 2007b). Presence elsewhere: Bangladesh, Barbados, Brazil, China, Colombia, Costa Rica, Cuba, Democratic People's Republic of Korea, East Timor, Guatemala, India, Indonesia, Jamaica, Korea, Malaysia, Myanmar, Nepal, Philippines, Puerto Rico, Russian Federation, Sri Lanka, Taiwan, Thailand, Trinidad and Tobago, US, Venezuela, Vietnam, Virgin Islands (CABI 2011).

Quarantine pest	***Phomopsis* sp.**
Synonyms	None
Common name(s)	Berry drop
Main hosts	*Vitis* spp. (grapevine) (Kinugawa *et al.* 2008)
Distribution	Presence in Australia: No records found. Many species of *Phomopsis* have been recorded from all states and territories in Australia (Plant Health Australia 2001a). However, berry drop disease caused by a *Phomopsis* pathogen is not known to occur in Australia. Presence in Japan: Kagawa (Kinugawa *et al.* 2008). Presence elsewhere: No records found.
Quarantine pest	***Phomopsis viticola* (Sacc.) Sacc.** EP, WA
Synonyms	*Cryptosporella viticola* Shear, *Diaporthe viticola* Nitschke, *Diplodia viticola* Desm., *Fusicoccum viticolum* Reddick, *Phoma flaccida* Viala & Ravaz, *Phoma viticola* Sacc.
Common name(s)	Phomopsis cane and leaf spot
Main hosts	*Vitis* spp. (grapevine) (Hewitt and Pearson 1988; Farr and Rossman 2013b)
Distribution	Presence in Australia: NSW, Qld, SA, Vic. (Plant Health Australia 2001a), Tas. (Mostert *et al.* 2001). Presence in Japan: Hokkaido, Honshu (Yamanashi, Nagano, Tottori and Okayama), Shikoku and Kyushu (Kobayashi 2007). Presence elsewhere: Algeria, Argentina, Austria, Belgium, Bosnia-Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Croatia, Egypt, France, Georgia, Germany, Greece, Hungary, India, Italy, Jersey, Kenya, Macedonia, Moldova, Netherlands, New Zealand, Poland, Portugal, Romania, Russia, Serbia and Montenegro, Slovenia, South Africa, Spain, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, US, Venezuela, Yugoslavia (former), Zimbabwe (CABI 2011).
Quarantine pest	***Physalospora baccae* sensu Nishikado non Cavara** EP
Synonyms	There has been some debate about the taxonomy of *Physalospora baccae*. The name *Physalospora baccae* Cavara, which was used to describe a new pathogen in Italy in 1888, is a nomen dubium of unknown application. It is not known if the grape pathogen to which this name is applied in Japan and Korea is the same as the original European pathogen. It was suggested that the grape pathogen in Japan/Korea should be designated as '*Physalospora baccae* sensu Asian authors' (Harman 2009). '*Physalospora baccae* sensu Nishikado non Cavara' is listed in the National Institute of Agrobiological Sciences Genebank Database of Plant Diseases in Japan (NIAS 2012). In China, *Physalospora baccae* Cavara has been considered to be a synonym of *Guignardia baccae* (Cav.) Jacz. (Tai 1979; Qi *et al.* 2007), which is not a valid name (Phillips 2000). *Guignardia baccae* (Cav.) Jacz. was included in the pest list provided by MAFF (1989) as a synonym of *Physalospora baccae* sensu Nishikado non Cavara.
Common name(s)	Grape cluster black rot
Main hosts	*Vitis* spp. (grapevine) (Zhang 2005; NYZSW 2009).
Distribution	Presence in Australia: No records found. Presence in Japan: Hiroshima, Hokkaido, Okayama, Osaka, Tochigi and Yamanashi prefectures (Nishikado 1921; 2007). Presence elsewhere: Besarabia, China, Portugal, South Korea, Spain (Bensaude 1926; Berro Aguilera 1926; Vekesciaghin 1933; Shin *et al.* 1984; Zhang 2005; NYZSW 2009).
Quarantine pest	***Pilidiella castaneicola* (Ellis & Everh.) Arx** WA
Synonyms	*Schizoparme straminea* Shear, *Coniella castaneicola* (Ellis & Everh.) B. Sutton
Common name(s)	Grapevine white rot
Main hosts	*Acer* sp., *Cary* sp., *Castanea* spp., *Eucalyptus* spp., *Fragaria* sp., *Liquidambar styracifolia* (sweet gum), *Metrosideros* sp., *Mangifera indica* (mango), *Quercus alba* (white oak), *Q. rubra* (red oak), *Quercus* sp., *Rhus copallina* (black sumac), *Rhus* sp., *Rosa rugosa-prostrata*, *Vitis cordifolia, V. vinifera* (grapevine) (Nag Raj 1993; Farr and Rossman 2012).
Distribution	Presence in Australia: NSW, NT, Qld, Vic., but not on grapevine (Plant Health Australia 2001a; Langrell *et al.* 2008). Presence in Japan: Ishikawa, Tottori, Shiga, Shimane and Tokushima prefectures (Kaneko 1981; Kobayashi 2007). Presence elsewhere: Cosmopolitan (Wang and Lin 2004). Reported present in Brazil, Canada, China, Cuba, India, Indonesia, Korea, Nigeria, Pakistan, South Africa, Switzerland, Taiwan, US, West Indies (Nag Raj 1993; Wang and Lin 2004; Farr and Rossman 2012).

Quarantine pest	***Pilidiella diplodiella* (Speg.) Crous & Van Niekerk** [WA]
Synonyms	*Coniella diplodiella* (Speg.) Petr. & Syd., *Coniothyrium diplodiella* (Speg.) Sacc
Common name(s)	Grapevine white rot, cluster drying-off, hail disease
Main hosts	*Vitis vinifera* (grapevine) is the principle host (Bisiach 1988; Van Niekerk *et al.* 2004). Also reported on *Hibiscus sabdariffa* (roselle) and *Artabotrys hexapetalos* (ylang ylang vine) (Shreemali 1973; Sánchez *et al.* 2011). Single reports on *Rosa* sp., *Geranium* sp., *Anogeissus latifolia* (buttontree) and *Citrus aurantiifolia* (lime) (Singh and Sinch 1966; Farr and Rossman 2013a).
Distribution	Presence in Australia: (Van Niekerk *et al.* 2004), NSW and Qld (Simmonds 1966; Plant Health Australia 2001b). Presence in Japan: Kobayashi (2007) considers *P. diplodiella* a synonym of *Coniella fragariae*. This author reports *C. fragariae* present in Hokkaido, Tochigi, Yamanashi, Nagano, Okayama, Tokushima and Saga prefectures. Presence elsewhere: Algeria, Austria, Brazil, Bulgaria, Canada, China, France, Germany, Great Britain, Greece, Hungary, India, Italy, Mexico, Nigeria, Rumania, Soviet Union (former), South Africa, Switzerland, Tanzania, Turkey, US, Uruguay, Yugoslavia (former) (Sutton and Waterston 1964; Van Niekerk *et al.* 2004; Farr and Rossman 2012).
Quarantine pest	***Citrus exocortis viroid*** [EP, WA]
Synonyms	None
Common name(s)	Citrus exocortis viroid
Main hosts	*Citrus* spp. (citrus) and relatives (Duran-Vila and Semancik 2003), *Vitis* spp. (grapevine) (Little and Rezaian 2003). The experimental host range includes *Aster grandiflorus*, *Capsicum annuum* (capsicum), *Chrysanthemum morifolium* (chrysanthemum), *Cucumis sativus* (cucumber), *Cucurbita pepo* (zucchini), *Dahlia variabilis* (dahlia), *Datura stramonium* (false castor-oil), *Gomphrena globosa* (globe-amaranth), *Gynura aurantiaca* (velvetplant), *Gynura sarmentosa*, *Lycopersicon esculentum* (tomato), *Lycopersicon peruvianum*, *Oscimum basilicum* (basil), *Petunia axillaris* (petunia), *Petunia hybrida* (petunia), *Petunia violacea* (violet-flower petunia), *Physalis floridana* (downy ground-cherry), *Physalis ixocarpa* (tomatillo ground-cherry), *Physalis peruviana* (Cape-gooseberry), *Solanum aculeatiisium*, *Solanum dulcamara* (bitter nightshade), *Solanum hispidum*, *Solanum integrifolium* (Chinese scarlet eggplant), *Solanum marginatum* (white-edge nightshade), *Solanum melongena* (aubergine), *Solanum quitoense* (Quito-orange), *Solanum topiro* (cocona), *Solanum tuberosum* (potato), *Tagetes patula* (French marigold), *Zinnia elegans* (zinnia) (Duran-Vila and Semancik 2003).
Distribution	Presence in Australia: NSW, Qld and SA (Barkley and Büchen-Osmond 1988). Presence in Japan: Yes (Sano 2003b). Presence elsewhere: Worldwide distribution. Present in Asia, Africa, North America, Central America, South America, Europe and Oceania (CABI 2011).
Quarantine pest	***Grapevine yellow speckle viroid-1*** [EP, WA]
Synonyms	Grapevine viroid-f (GVd-f), Grapevine viroid-1 (GV-1)
Common name(s)	Grapevine yellow speckle disease
Main hosts	*Vitis* spp. (grapevine) (CIHEAM 2006)
Distribution	Presence in Australia: Yes (Koltunow *et al.* 1989). But not known to be present in WA. Presence in Japan: Yes (Sano 2003b; NIAS 2012; Jiang *et al.* 2012). Presence elsewhere: Worldwide distribution (Martelli 1993; CIHEAM 2006) including Albania, Bulgaria, Cyprus, France, Germany, Greece, Italy, Spain (Pallás *et al.* 2003b), Tunisia (Hadidi *et al.* 2003b) and China (Han *et al.* 2003).
Quarantine pest	***Grapevine yellow speckle viroid-3*** [EP]
Synonyms	Chinese grapevine viroid
Common name(s)	Grapevine yellow speckle disease
Main hosts	*Vitis* spp. (grapevine) (Jiang *et al.* 2009)
Distribution	Presence in Australia: No records found. Presence in Japan: Yes (Jiang *et al.* 2012). Presence elsewhere: China (Jiang *et al.* 2009). Jiang *et al.* (2009) suggest that this viroid may be closely related to GYSVd-1 ‘type 2’ and ‘type 3’ previously identified in Germany and Italy.

Quarantine pest	***Hop stunt viroid*** EP, WA
Synonyms	None
Common name(s)	Hop stunt viroid
Main hosts	*Vitis* spp. (grapevine) (Little and Rezaian 2003); *Humulus lupulus* (hops) (Sano 2003a); *Prunus armeniaca* (apricot) (Pallás *et al.* 2003a); *Prunus persica* (peach) (Sano *et al.* 1989; Hassan *et al.* 2003); *Prunus domestica* (plum) (Sano *et al.* 1989; Yang *et al.* 2006); *Prunus dulcis* (almond) (Pallás *et al.* 2003a); *Prunus avium* (sweet cherry) (Gazel *et al.* 2008); *Prunus cerasus* (sour cherry) (Gazel *et al.* 2008); *Ziziphus jujuba* (jujube) (Zhang *et al.* 2009); *Citrus* spp. (citrus); *Punica granatum* (pomegranate) (Astruc *et al.* 1996); *Ficus carica* (common fig) (Yakoubi *et al.* 2007).
Distribution	Presence in Australia: SA and Vic. (Koltunow *et al.* 1988). Presence in Japan: Yes (Sano *et al.* 1985; Sano *et al.* 1986; Sano 2003b; Jiang *et al.* 2012). Presence elsewhere: Bosnia and Herzegovina (Matic *et al.* 2005); Canada (Michelutti *et al.* 2004); China (Guo *et al.* 2008; Zhang *et al.* 2009); Cyprus (Pallas *et al.* 1998); Czech Republic (Hassan *et al.* 2003); Finland (EPPO 2009b); Greece (Pallas *et al.* 1998); India, Italy, Jamaica (Bennett *et al.* 2009); Korea (Lee *et al.* 1988); Lebanon (Choueiri *et al.* 2002; Ghanem-Sabanadzovic and Choueiri 2003); Morocco (Pallas *et al.* 1998); Pakistan, Serbia (Mandic *et al.* 2008); Spain (Pallas *et al.* 1998; Amari *et al.* 2007); Tunisia (Hassen *et al.* 2004); Turkey (Gazel *et al.* 2008); US (Eastwell and Nelson 2007; European Food Safety Authority 2008; Osman *et al.* 2012).
Quarantine pest	***Grapevine fanleaf virus*** EP, WA
Synonyms	Grapevine arricciamento virus; Grapevine court noué virus; Grapevine fanleaf nepovirus; Grapevine infectious degeneration virus; Grapevine Reisigkrankheit virus; Grapevine roncet virus; Grapevine urticado virus; Grapevine veinbanding virus; Grapevine yellow mosaic virus
Common name(s)	Grapevine fanleaf virus
Main hosts	*Vitis* spp. (grapevine) (CIHEAM 2006)
Distribution	Presence in Australia: NSW (Emmett and Hamilton 1994; Plant Health Australia 2001a), SA (Stansbury *et al.* 2000; Habili *et al.* 2001), Vic. (Emmett and Hamilton 1994; Habili *et al.* 2001). Presence in Japan: Yes (MAFF 2008a; NIAS 2012). Presence elsewhere: Worldwide (CIHEAM 2006). Albania, Algeria, Argentina, Armenia, Austria, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Croatia, Cyprus, Czech Republic, Egypt, France, Germany, Greece, Hungary, Iran, Israel, Italy, Jordan, Kazakhstan, Lebanon, Macendonia, Madagascar, Malta, Mexico, Moldova, Morocco, New Zealand, Nigeria, Philippines, Portugal, Romania, Russian Federation, Serbia and Montenegro, Slovakia, Slovenia, South Africa, Spain, Switzerland, Syria, Tunisia, Turkey, Ukraine, US, Venezuela (CABI 2011).
Quarantine pest	***Tobacco necrosis viruses*** EP
Synonyms	(The names below are used for distinct necrovirus species that have been called 'tobacco necrosis virus') *Chenopodium necrosis virus*, *Olive mild mosaic virus*, *Tobacco necrosis virus A*, *Tobacco necrosis virus D*, *Tobacco necrosis virus Nebraska isolate*
Common name(s)	Tobacco necrosis virus
Main hosts	*Brassica oleracea* (cabbage), *Chenopodium quinoa* (quinoa), *Cucumis sativus* (cucumber), *Cucurbita pepo* (zucchini), *Daucus carota* (carrot), *Fragaria × ananassa* (strawberry), *Glycine max* (soybean), *Malus pumila* (apple), *Nicotiana tabacum* (tobacco), *Lactuca sativa* (lettuce), *Olea europaea* (olive), *Phaseolus vulgaris* (common bean), *Solanum tuberosum* (potato), *Tulipa* sp. (tulip) (other hosts are infected but remain symptomless) (Kassanis 1970; Brunt and Teakle 1996; CABI 2009; Zitikaite and Staniulis 2009).
Distribution	Presence in Australia: Qld and Vic. (Finlay and Teakle 1969; Teakle 1988; Plant Health Australia 2001a). Presence in Japan: Yes (Tezuka *et al.* 1974; Kaname 1974; Matsunami *et al.* 1977; MAFF 2008a; Zitikaite and Staniulis 2009; NIAS 2013). Presence elsewhere: (probably worldwide but species and strain distributions are largely unknown) Belgium, Brazil, Canada (CABI 2009); China (Huang *et al.* 1984; Xi *et al.* 2008); Czechoslovakia (former), Denmark, Finland, France, Germany, Hungary, India, Italy, Latvia, Netherlands, New Zealand, Norway, Romania, Russia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom (CABI 2009).

Quarantine pest	***Tomato ringspot virus*** EP
Synonyms	Blackberry (Himalaya) mosaic virus; Euonymus chlorotic ringspot virus; Euonymus ringspot virus; grape yellow vein virus; grapevine yellow vein virus; Nicotiana 13 virus; peach stem pitting virus; prune brown line virus; Prunus stem pitting virus; red currant mosaic virus; tobacco ringspot virus 2; tomato ringspot nepovirus; winter peach mosaic virus
Common name(s)	Tomato ringspot virus, Ringspot and mosaic (in various hosts), Eola rasp leaf (in cherries), yellow bud mosaic (in peaches), yellow vein (in grapes), stunt or stub head (in *Gladiolus*), decline, crumby berry and yellow blotch curl (in raspberries), chlorosis (in *Pelargonium*) (English); Tomatenringfleckenkrankheit (German)
Main hosts	*Cornus* sp. (dogwood), *Cucumis sativus* (cucumber), *Euonymus* spp., *Fragaria* x *ananassa* (strawberry), *Fraxinus americana* (ash), *Gladiolus* sp., *Glycine max* (soybean), *Hydrangea* sp., *Lotus corniculatus* (birdsfoot-trifoil), *Malus domestica* (apple), *Nicotiana tabacum* (tobacco), Orchidaceae, *Pelargonium* sp., *Pentas lanceolata* (Egyptian starflower), *Phaseolus vulgaris* (common bean), *Prunus* spp*., Ribes nigrum* (black currant), *Ribes rubrum* (red current), *Ribes uva-crispa* (gooseberry), *Rubus* sp. (blackberry), *Rubus idaeus* (raspberry), *Sambucus canadensis* (elderberry), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Vaccinium corymbosum* (blueberry), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine) (Chu *et al.* 1983; Stace-Smith 1984; Sherf and MacNab 1986; Brown *et al.* 1993; CABI-EPPO 1997f; EPPO 2005; Adaskaveg and Caprile 2010; Adaskaveg *et al.* 2012) and weeds, including *Chenopodium berlandieri* (lambsquarters), *Cichorium intyhus* (chicory), *Euphorbia* spp. (spurge), *Malva parviflora* (little mallow), *Medicago lupulina* (black medic), *Picris echioides* (bristly oxtongue), *Plantago* spp. (plaintain), *Prunella vulgaris* (healall), *Rumex acetosell* (sheep sorrel), *Stellaria* spp. (common chickweed), *Taraxacum officinale* (dandelion), *Trifolium repens* (white clover), *Verbascum* spp. (mullein) and *Verbascum blattaria* (moth mullein) (Powell *et al.* 1984; Tuttle and Gotlieb 1985; Adaskaveg *et al.* 2012).
Distribution	Presence in Australia: Recorded in SA (Chu *et al.* 1983), but there are no further records, the infected plants no longer exist, and the virus is believed to be absent from Australia. Presence in Japan: Yes (Iwaki and Komuro 1971; Iwaki and Komuro 1974; NIAS 2013). Presence elsewhere: Argentina, Belarus, Canada, Chile, China, Croatia, Egypt, Finland, France, Germany, Greece, Iran, Ireland, Italy, Jordan, Korea, Lithuania, Mexico, New Zealand, Oman, Pakistan, Peru, Puerto Rico, Russian Federation, Serbia and Montenegro, Slovakia, Slovenia, Taiwan, Togo, Tunisia, Turkey, United Kingdom, US, Venezuela (CABI-EPPO 1997f; CABI 2011).

Appendix C Biosecurity framework

Australia's biosecurity policies

The objective of Australia's biosecurity policies and risk management measures is the prevention or control of the entry, establishment or spread of pests and diseases that could cause significant harm to people, animals, plants and other aspects of the environment.

Australia has diverse native flora and fauna and a large agricultural sector, and is relatively free from the more significant pests and diseases present in other countries. Therefore, successive Australian Governments have maintained a conservative, but not a zero-risk, approach to the management of biosecurity risks. This approach is consistent with the World Trade Organization's (WTO's) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement).

The SPS Agreement defines the concept of an 'appropriate level of protection' (ALOP) as the level of protection deemed appropriate by a WTO Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory. Among a number of obligations, a WTO Member should take into account the objective of minimising negative trade effects in setting its ALOP.

Like many other countries, Australia expresses its ALOP in qualitative terms. Australia's ALOP, which reflects community expectations through Australian Government policy, is currently expressed as providing a high level of sanitary and phytosanitary protection, aimed at reducing risk to a very low level, but not to zero.

Consistent with the SPS Agreement, in conducting risk analyses Australia takes into account as relevant economic factors:

- the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease in the territory of Australia
- the costs of control or eradication of a pest or disease
- and the relative cost-effectiveness of alternative approaches to limiting risks.

Roles and responsibilities within Australia's quarantine system

Australia protects its human, animal and plant life or health through a comprehensive quarantine system that covers the quarantine continuum, from pre-border to border and post-border activities. The Australian Government Department of Health is responsible for human health aspects of quarantine.

Pre-border, Australia participates in international standard-setting bodies, undertakes risk analyses, develops offshore quarantine arrangements where appropriate, and engages with our neighbours to counter the spread of exotic pests and diseases.

At the border, Australia screens vessels (including aircraft), people and goods entering the country to detect potential threats to Australian human, animal and plant health.

The Australian Government also undertakes targeted measures at the immediate post-border level within Australia. This includes national co-ordination of emergency responses to pest and disease incursions. The movement of goods of quarantine concern within Australia's border is the responsibility of relevant state and territory authorities, which undertake inter- and intra-state quarantine operations that reflect regional differences in pest and disease status, as a part of their wider plant and animal health responsibilities.

Roles and responsibilities within the Department

The Australian Government Department of Agriculture is responsible for the Australian Government's animal and plant biosecurity policy development and the establishment of risk management measures. The Secretary of the department is appointed as the Director of Animal and Plant Quarantine under the *Quarantine Act 1908* (the Act).

The Department takes the lead in biosecurity and quarantine policy development and the establishment and implementation of risk management measures across the biosecurity continuum, and:

- **Pre-border** conducts risk analyses, including IRAs, and develops recommendations for biosecurity policy as well as providing quarantine policy advice to the Director of Animal and Plant Quarantine
- **At the border** develops operational procedures, makes a range of quarantine decisions under the Act (including import permit decisions under delegation from the Director of Animal and Plant Quarantine) and delivers quarantine services
- **Post border** coordinates pest and disease preparedness, emergency responses and liaison on inter- and intra-state quarantine arrangements for the Australian Government, in conjunction with Australia's state and territory governments.

Roles and responsibilities of other government agencies

State and territory governments play a vital role in the quarantine continuum. The department works in partnership with state and territory governments to address regional differences in pest and disease status and risk within Australia, and develops appropriate sanitary and phytosanitary measures to account for those differences. Australia's partnership approach to quarantine is supported by a formal Memorandum of Understanding that provides for consultation between the Australian Government and the state and territory governments.

Depending on the nature of the good being imported or proposed for importation, the Department of Agriculture may consult other Australian Government authorities or agencies in developing its recommendations and providing advice.

As well as a Director of Animal and Plant Quarantine, the Act provides for a Director of Human Quarantine. The Australian Government Department of Health is responsible for human health aspects of quarantine and Australia's Chief Medical Officer within that Department holds the position of Director of Human Quarantine. The Department of Agriculture may, where appropriate, consult with that Department on relevant matters that may have implications for human health.

The Act also requires the Director of Animal and Plant Quarantine, before making certain decisions, to request advice from the Environment Minister and to take the advice into account when making those decisions. The Australian Government Department of Environment is responsible under the *Environment Protection and Biodiversity Conservation*

Act 1999 for assessing the environmental impact associated with proposals to import live species. Anyone proposing to import such material should contact the Department of Environment directly for further information.

When undertaking risk analyses, the Department of Agriculture consults with the Department of Environment about environmental issues and may use or refer to the Department of Environment's assessment.

Australian quarantine legislation

The Australian quarantine system is supported by Commonwealth, state and territory quarantine laws. Under the Australian Constitution, the Commonwealth Government does not have exclusive power to make laws in relation to quarantine, and as a result, Commonwealth and state quarantine laws can co-exist.

Commonwealth quarantine laws are contained in the *Quarantine Act 1908* and subordinate legislation including the *Quarantine Regulations 2000*, the *Quarantine Proclamation 1998*, the *Quarantine (Cocos Islands) Proclamation 2004* and the *Quarantine (Christmas Island) Proclamation 2004*.

The quarantine proclamations identify goods, which cannot be imported, into Australia, the Cocos Islands and or Christmas Island unless the Director of Animal and Plant Quarantine or delegate grants an import permit or unless they comply with other conditions specified in the proclamations. Section 70 of the *Quarantine Proclamation 1998*, section 34 of the *Quarantine (Cocos Islands) Proclamation 2004* and section 34 of the *Quarantine (Christmas Island) Proclamation 2004* specify the things a Director of Animal and Plant Quarantine must take into account when deciding whether to grant a permit.

In particular, a Director of Animal and Plant Quarantine (or delegate):

- must consider the level of quarantine risk if the permit were granted, and
- must consider whether, if the permit were granted, the imposition of conditions would be necessary to limit the level of quarantine risk to one that is acceptably low, and
- for a permit to import a seed of a plant that was produced by genetic manipulation—must take into account any risk assessment prepared, and any decision made, in relation to the seed under the Gene Technology Act, and
- may take into account anything else that he or she knows is relevant.

The level of quarantine risk is defined in section 5D of the *Quarantine Act 1908*. The definition is as follows:

> reference in this Act to a *level of quarantine risk* is a reference to:
>
> (a) the probability of:
>
> (i) a disease or pest being introduced, established or spread in Australia, the Cocos Islands or Christmas Island; and
>
> (ii) the disease or pest causing harm to human beings, animals, plants, other aspects of the environment, or economic activities; and

(b) the probable extent of the harm.

The *Quarantine Regulations 2000* were amended in 2007 to regulate keys steps of the import risk analysis process. The Regulations:

- define both a standard and an expanded IRA;
- identify certain steps, which must be included in each type of IRA;
- specify time limits for certain steps and overall timeframes for the completion of IRAs (up to 24 months for a standard IRA and up to 30 months for an expanded IRA);
- specify publication requirements;
- make provision for termination of an IRA; and
- allow for a partially completed risk analysis to be completed as an IRA under the Regulations.

The Regulations are available on the ComLaw website.

International agreements and standards

The process set out in the *Import Risk Analysis Handbook 2011* is consistent with Australia's international obligations under the SPS Agreement. It also takes into account relevant international standards on risk assessment developed under the International Plant Protection Convention (IPPC) and by the World Organisation for Animal Health (OIE).

Australia bases its national risk management measures on international standards where they exist and when they achieve Australia's ALOP. Otherwise, Australia exercises its right under the SPS Agreement to apply science-based sanitary and phytosanitary measures that are not more trade restrictive than required to achieve Australia's ALOP.

Notification obligations

Under the transparency provisions of the SPS Agreement, WTO Members are required, among other things, to notify other members of proposed sanitary or phytosanitary regulations, or changes to existing regulations, that are not substantially the same as the content of an international standard and that may have a significant effect on trade of other WTO Members.

Risk analysis

Within Australia's quarantine framework, the Australian Government uses risk analyses to assist it in considering the level of quarantine risk that may be associated with the importation or proposed importation of animals, plants or other goods.

In conducting a risk analysis, the Department of Agriculture:

- identifies the pests and diseases of quarantine concern that may be carried by the good
- assesses the likelihood that an identified pest or disease would enter, establish or spread
- assesses the probable extent of the harm that would result.

If the assessed level of quarantine risk exceeds Australia's ALOP, the Department of Agriculture will consider whether there are any risk management measures that will reduce quarantine risk to achieve the ALOP. If there are no risk management measures that reduce the risk to that level, trade will not be allowed.

Risk analyses may be carried out by the Department of Agriculture's specialists, but may also involve relevant experts from state and territory agencies, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), universities and industry to access the technical expertise needed for a particular analysis.

Risk analyses are conducted across a spectrum of scientific complexity and available scientific information. An IRA is a type of risk analysis with key steps regulated under the *Quarantine Regulations 2000*. The Department of Agriculture's assessment of risk may also take the form of a non-regulated analysis of existing policy or technical advice. Further information on the types of risk analysis is provided in the *Import Risk Analysis Handbook 2011*.

Glossary

Term or abbreviation	Definition
Additional declaration	A statement that is required by an importing country to be entered on a phytosanitary certificate and which provides specific additional information on a consignment in relation to regulated pests (FAO 2012).
Anamorph	An asexual stage in the life cycle of a fungus, also known as the imperfect state of a fungus.
Appropriate level of protection (ALOP)	The level of protection deemed appropriate by the Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory (WTO 1995).
Area	An officially defined country, part of a country or all or parts of several countries (FAO 2012).
Area of low pest prevalence	An area, whether all of a country, part of a country, or all parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures (FAO 2012).
Arthropod	The largest phylum of animals, including the insects, arachnids and crustaceans.
Asexual reproduction	The development of new individual from a single cell or group of cells in the absence of meiosis.
Biosecurity Australia	The previous name for the unit, within the Department of Agriculture, responsible for recommendations for the development of Australia's biosecurity policy. These functions are undertaken within the Plant Division of the Department.
Cane (grapevine)	A cane is a ripened shoot of a grapevine that has grown from a new bud located on the cordon. A shoot is called a cane when it changes colour from green to brown during veraison. Shoots give rise to leaves, tendrils and grape clusters.
Consignment	A quantity of plants, plant products and/or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots) (FAO 2012).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO 2012).
Diapause	Period of suspended development/growth occurring in some insects, in which metabolism is decreased.
Disease	A condition of part or all of an organism that may result from various causes such as infection, genetic defect or environmental stress.
Endangered area	An area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss (FAO 2012).
Endemic	Belonging to, native to, or prevalent in a particular geography, area or environment.
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO 2012).
Establishment	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO 2012).
Fecundity	The fertility of an organism.
Fresh	Living; not dried, deep-frozen or otherwise conserved (FAO 2012).
Fumigation	A method of pest control that completely fills an area with gaseous pesticides to suffocate or poison the pests within.
Genus	A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.
Host	An organism that harbours a parasite, mutual partner, or commensal partner, typically providing nourishment and shelter.
Host range	Species capable, under natural conditions, of sustaining a specific pest or other organism (FAO 2012).
Import permit	Official document authorising importation of a commodity in accordance with specified phytosanitary import requirements (FAO 2012).
Import risk analysis	An administrative process through which quarantine policy is developed or reviewed, incorporating risk assessment, risk management and risk communication.

Term or abbreviation	Definition
Infection	The internal ‘endophytic’ colonisation of a plant, or plant organ, and is generally associated with the development of disease symptoms as the integrity of cells and/or biological processes are disrupted.
Infestation (of a commodity)	Presence in a commodity of a living pest of the plant or plant product concerned. Infestation includes infection (FAO 2012).
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations (FAO 2012).
Intended use	Declared purpose for which plants, plant products, or other regulated articles are imported, produced, or used (FAO 2012).
Interception (of a pest)	The detection of a pest during inspection or testing of an imported consignment (FAO 2012).
International Standard for Phytosanitary Measures (ISPM)	An international standard adopted by the Conference of the Food and Agriculture Organization, the Interim Commission on phytosanitary measures or the Commission on phytosanitary measures, established under the IPCC (FAO 2012).
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO 2012).
Lot	A number of units of a single commodity, identifiable by its homogeneity of composition, origin etc., forming part of a consignment (FAO 2012). Within this report a ‘lot’ refers to a quantity of fruit of a single variety, harvested from a single production site during a single pick and packed at one time.
Mature fruit	Commercial maturity is the start of the ripening process. The ripening process will then continue and provide a product that is consumer-acceptable. Maturity assessments include colour, starch, index, soluble solids content, flesh firmness, acidity, and ethylene production rate.
Mortality	The total number of organisms killed by a particular disease.
National Plant Protection Organization (NPPO)	Official service established by a government to discharge the functions specified by the IPPC (FAO 2012).
Official control	The active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests (FAO 2012).
Parthenogenesis	Production of an embryo from unfertilised egg.
Pathogen	A biological agent that can cause disease to its host.
Pathway	Any means that allows the entry or spread of a pest (FAO 2012).
Pest	Any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products (FAO 2012).
Pest categorisation	The process for determining whether a pest has or has not the characteristics of a quarantine pest or those of a regulated non-quarantine pest (FAO 2012).
Pest free area (PFA)	An area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained (FAO 2012).
Pest free place of production	Place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period (FAO 2012).
Pest free production site	A defined portion of a place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period and that is managed as a separate unit in the same way as a pest free place of production (FAO 2012).
Pest risk analysis (PRA)	The process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it (FAO 2012).
Pest risk assessment (for quarantine pests)	Evaluation of the probability of the introduction and spread of a pest and of the associated potential economic consequences (FAO 2012).
Pest risk management (for quarantine pests)	Evaluation and selection of options to reduce the risk of introduction and spread of a pest (FAO 2012).
Pest status (in an area)	Presence or absence, at the present time, of a pest in an area, including where appropriate its distribution, as officially determined using expert judgement on the basis of current and historical pest records and other information (FAO 2012).
Phloem	In vascular plants, the tissue that carries organic nutrients to all parts of the plant where needed.

Term or abbreviation	Definition
Phytosanitary certificate	An official paper document or its official electronic equivalent, consistent with the model of certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (FAO 2012).
Phytosanitary certification	Use of phytosanitary procedures leading to the issue of a phytosanitary certificate (FAO 2012).
Phytosanitary measure	Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO 2012).
Phytosanitary procedure	An official method for implementing phytosanitary measures including the performance of inspections, tests, surveillance or treatments in connection with regulated pests (FAO 2012).
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, including establishment of procedures for phytosanitary certification (FAO 2012).
Polyphagous	Feeding on a relatively large number of hosts from different plant family and/or genera.
PRA area	Area in relation to which a pest risk analysis is conducted (FAO 2012).
Practically free	Of a consignment, field or place of production, without pests (or a specific pest) in numbers or quantities in excess of those that can be expected to result from, and be consistent with good cultural and handling practices employed in the production and marketing of the commodity (FAO 2012).
Production site	In this report, a production site is a continuous planting of table grape vines treated as a single unit for pest management purposes. If a vineyard is subdivided into one or more units for pest management purposes, then each unit is a production site. If the vineyard is not subdivided, then the vineyard is also the production site.
Quarantine	Official confinement of regulated articles for observation and research or for further inspection, testing or treatment (FAO 2012).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO 2012).
Regulated article	Any plant, plant product, storage place, packing, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved (FAO 2012).
Regulated pest	A quarantine pest or a regulated non-quarantine pest (FAO 2012).
Restricted risk	Risk estimate with phytosanitary measure(s) applied.
Saprophyte	An organism deriving its nourishment from dead organic matter.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO 2012).
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures.
Stakeholders	Government agencies, individuals, community or industry groups or organizations, whether in Australia or overseas, including the proponent/applicant for a specific proposal, who have an interest in the policy issues.
Systems approach(es)	The integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the appropriate level of protection against regulated pests.
Teleomorph	The sexual stage of the life cycle of a fungus. Also called the perfect stage.
Trash	Soil, splinters, twigs, leaves, and other plant material, other than fruit stalks.
Treatment	Official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalisation (FAO 2012).
Unrestricted risk	Unrestricted risk estimates apply in the absence of risk mitigation measures.
Vector	An organism that does not cause disease itself, but which causes infection by conveying pathogens from one host to another.
Viable	Alive, able to germinate or capable of growth.

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