ENVIRONMENTAL RISK MANAGEMENT AUTHORITY
NGĀ KAIWHAKATŪPATO WHAKARARU TAIAO

ERMA New Zealand

FORM 2

Application for approval to

IMPORT INTO CONTAINMENT ANY NEW ORGANISM

under Section 40 of the Hazardous Substances and New Organisms Act 1996

Office use only ☐☐☐☐☐☐☐☐

Fees $_____ Date received ___/__ /___ Verified date ___/__ /___ _____Job manager

Application for approval to import into containment any new organism under Section 40 of the Hazardous Substances and New Organisms Act 1996

IMPORTANT

Before you fill in this application form please talk to ERMA New Zealand. We can help you scope and prepare your application. The scale of information we need should match the potential significance of the application. For example, applications which may pose a significant risk to the environment or to human health need to be supported with more substantial information than applications which clearly pose a more minor risk.

We need all relevant information early on in the application process. Quality information up front will speed up the process.

Any extra material that does not fit in the application form must be clearly labelled and cross-referenced in the application form. Commercially sensitive information should be collated in a separate document.

All applicants must sign at the end of the form and enclose the correct application fee. Please check ERMA New Zealand's current pricing policy, we are unable to process applications that do not contain the correct fee.

All references to regulations in this form, unless otherwise noted, refer to the Hazardous Substances and New Organisms (New Organisms Forms and Information Requirements) Regulations 1998.

Copies of all our application forms will soon also be available on our website: www.ermanz.govt.nz, and also in electronic form (MS Word format).

If you have any suggestions for improvements to this form, please contact our operations staff at the address below.

You can get more information at any time by telephoning, writing to, or calling in at our Wellington office. One of our staff members will be able to help you.

List of application forms for new organisms:

These are all our application forms related to new organisms. Please check you have the right one.

Form 1	Application for approval under section 34 of the Act to import for release, or release from containment, any new organism — including rapid assessment.
Form 2	application for approval under section (40)(1)(a) of the Act to import into containment any new organism **(this form)**.
Form 3	application for approval under section 40(1)(b) of the Act to develop in containment any genetically modified organism – including rapid assessment.
Form 4	application for approval under section 40(1)(c) to field test (including large scale fermentation) in containment any genetically modified organism.
Form 5	application for approval under section 47 to use a new organism in an emergency.
Form 6	application for approval under section 62 for grounds for reassessment of a new organism in containment.

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Applicant details

1. Name and address in New Zealand of the applicant:

This should be the organisation or person formally responsible for this application.

Name: National Plant Pest Reference Laboratory, Ministry of Agriculture and Forestry

Address: Mrs. Lindsay Hawke, Gerald Street, PO Box 24, Lincoln 8152

Phone: 03 325 3914

2. The applicant's address for service in New Zealand (if different from above):

Address: As above

3. Name of the contact person for the application (if different from applicant): **This person should have sufficient knowledge to respond to queries and have the authority to make decisions on behalf of the applicant that relate to processing the application.**

Administrative/Financial queries

Name: Lindsay Hawke (Facility Operator)

Position: National Manager, National Plant Pest Reference Laboratory

Phone: 03 325 3914

Fax: 03 325 3909 **Email:** hawkel@maf.govt.nz

Technical queries

Name: Gerard Clover

Position: National Adviser, Genetically Modified Organisms - Plants, MAF Biosecurity Authority

Phone: 04 470 2743

Fax: 04 474 4257 **Email:** cloverg@maf.govt.nz

4. Summary

Provide a summary of the information contained in this application relating to the identification of the organism.

The information should include summaries of:

- the identity of the organism;
- if it is a genetically modified organism, the source of the donor nucleic acid material and the purpose of the modification;
- what the organism will be used for and why it has been selected.

Provide a summary of the information contained in this application relating to the assessment of the effects of the organism.

The information should include summaries of:

- the risks, costs and benefits and the assessment of these;
- the containment system proposed.

This summary will be used to provide information to people and agencies who may request it. Applications to import any new organism into containment will not be publicly notified. However, as the information in this section may be released upon request, applicants should ensure that this summary does not contain any commercially sensitive information.

[Yes] further information

The purpose of this application is to seek permission for laboratories carrying out diagnostic tests on quarantine and surveillance samples (in particular the National Plant Pest Reference Laboratory (NPPRL), but also various crown research institutes and universities – see section 14) to import identified species of plant viruses and viroids not present in New Zealand in an inactive form into containment. This material will be used to develop diagnostic tests and act as reference material during testing, thereby ensuring maintenance of New Zealand's biosecurity.

Because of its physical and until recently, economic isolation, New Zealand has relatively few of the plant pathogens that plague many crops overseas. If introduced, such pathogens (*e.g. Plum pox virus*, *Potato mop-top virus*) would cause huge economic losses in New Zealand's crops and might have unforeseen effects on the native biota. To reduce the risks of introducing such pathogens, the Ministry of Agriculture and Forestry (MAF) has introduced a series of measures such as sourcing material from pathogen-free areas or accredited offshore facilities, and pre- and post-export inspection, testing and treatment. MAF also uses surveillance programmes to enable the early detection and potential eradication of organisms that have passed the border. For both the import and surveillance programmes, there is a need to develop and implement testing procedures for the detection of viruses and viroids.

Approximately 130 plant viruses and 7 plant viroids, of the *c*. 930 and 34 which have so far been reported respectively, are present in New Zealand (McLean & Mossop, 1988; Pennycook, 1989; Brunt *et al*., 1996; van Regenmortel *et al*., 2000; PPIN, 2001). Excluding such organisms relies on their detection, prior to export, at the border or most commonly in post-entry quarantine material in transitional facilities. A number of methods are available to identify viruses and viroids including electron microscopy, mechanical transmission to herbaceous indicators, and serological and molecular techniques. In combination, electron microscopy and mechanical transmission can generally detect virus and viroid infection but are generally unable to give identification to species. Therefore it is not possible to determine whether the organism is already present in New Zealand. Of even greater importance is the limited sensitivity and the time required for such methods. Therefore the more specific and

sensitive serological and molecular techniques are being used increasingly to enforce regulations at the border. However, to ensure the correct performance of such tests it is imperative to have virus- or viroid- infected reference material to act as positive controls for the test. Without such material there is a distinct possibility that "false negative" results may be obtained and the border compromised inadvertently. This application is intended to facilitate the importation of samples of virus- and viroid- infected plant material into containment for the specific purpose of conducting diagnostic tests. Since plants may arrive at the border infected with any virus or viroid, this application includes all of the *c*. 800 plant viruses (71 genera in 14 families) and 27 plant viroids (8 genera in 3 families) currently not present in New Zealand (Table 2, Appendices 1 and 2). However, it is not likely that any one organisation would need to import samples of more than 50-100 viruses and/or 10-20 viroids at most.

All plant viruses and viroids are obligate parasites, **this application will only enable viruses and viroids to be imported in an "inactive" state** in dried (and therefore dead) plant tissue rather than actively reproducing in an infected plant. Many viruses and viroids (e.g. *c*. 25 % of viruses) in such infected material are completely inactive and could legitimately be classified as non-living and therefore outside the remit of the Hazardous Substances and New Organisms Act, 1996 (HSNO Act). However, a number of them are mechanically transmissible and therefore under specific conditions could be "resurrected" from this state to infect a limited number of plant species. Therefore an application is required to import these organisms under section 40 of the HSNO Act. However, it should be noted that almost all such mechanically transmissible viruses and viroids are only transmissible under specific laboratory conditions and their mechanical transmissibility is either reduced or removed by drying. Furthermore, many of the most mechanically transmissible viruses are already in New Zealand. **This application specifically excludes using imported virus- and viroid-infected material to deliberately infect new, live plant hosts.**

Previous to the implementation of the HSNO Act on 29 July 1998, MAF allowed the importation of such virus- and viroid-infected reference material for use in diagnosis. Such importations were controlled by permits which detailed the restrictions which applied to the use of such material. For example, the permits issued for the six months prior to the commencement of the HSNO Act allowed the importation of some 180 viruses and 4 viroids, the majority into the Plant Protection Centre at Lynfield (which upon restructuring in November 1998 became the NPPRL). NPPRL (and its predecessors) has imported such infected material for at least the last twenty years and there is no record of any breach of containment during this period. Since the implementation of the HSNO Act, MAF has continued to allow the importation of either non-viable infected reference material or viable material infected with regulated strains of viruses and viroids present in the country prior to the commencement of the HSNO Act. No viable material of species not present prior to this time has been allowed to be imported and this has proved to be a serious restraint on the NPPRL's ability to diagnose such pathogens.

Since the need to diagnose plant viruses and viroids will be an ongoing requirement for import and surveillance programmes, this application seeks open-ended approval for the activity described. All material will be imported from either culture collections or recognized experts in the field and will be identified to species level prior to importation. Each imported species will be labelled upon arrival at the border and will be packaged so that containment may not be breached accidentally during transit. A register will be kept of all samples of reference material imported, to include the number of importations, their identity, origin (source, country) and fate. If required a copy of this register will be sent annually to the Authority. **Reference material will only be imported into the country as required**. The scope of this application does not include culture collections and no material will be imported to be held in such a permanent repository. However, infected reference material will need to be kept in storage where there is an ongoing requirement for access to such material. Some reference material is also expensive to purchase and/or difficult to obtain because it is not commercially available or only available seasonally. Of the *c*. 100 organisms that any organisation would be likely to import, perhaps half may be kept in storage for approximately one year.

No adverse public health, environmental or cultural effects are anticipated as a result of these organisms being imported into containment. None of the organisms are human pathogens or pose a threat to human health. No part of this work will have specific relevance to Maori or have any known or possible effect on the relationship of Maori with their taonga.

Importation of these organisms in an "inactive" state represents a negligible environmental risk. With the exception of a limited number (19) of easily mechanically transmissible viruses, none of the viruses have any means of active dispersal or infection of new hosts and therefore can not survive in the environment. A number of the plant viroids are easily transmitted mechanically but their transmission is less well characterized and therefore all 27 will be treated as if they are easily transmissible in this way. The risks associated with the easily mechanically transmissible viruses and viroids (Tables 1 and 2) are very low and will be further reduced by only importing samples for defined and time-limited purposes, e.g. during an outbreak situation, and prohibiting storage of such material. Additionally, a number of measures will be taken to minimize the risks associated with importing all of the proposed viruses and viroids, including carrying out all work in a PC2 laboratory in a containment facility, limiting the amount of material and from where it is imported and specifying how they must be used and stored.

This application will only enable viruses and viroids to be imported in an "inactive" state. It is difficult to generalise on the impacts that the viruses and viroids included in this application would have if released in an **active** state into New Zealand. The impact of these *c*. 830 organisms varies hugely in their native environments. Since they are new organisms, MAF defines them as regulated organisms for which phytosanitary actions would be undertaken if detected. MAF sub-divides regulated organisms into three risk groups according to their potential impact. None of the organisms in this application are Risk Group 3 pests, that is the most economically damaging pests. Six viruses are defined as Risk Group 2 pests which if introduced could cause a major disruption to market access and/or significant economic impacts on the production of a particular commodity/commodities and/or the environment. The remainder are either uncategorized or classified as Risk Group 1 pests. The latter group of pests could cause unacceptable economic impacts on the production of a commodity/ commodities and/or the environment.

Access to virus- and viroid-infected reference material will significantly improve New Zealand's ability to identify exotic plant viruses and viroids in quarantine or surveillance samples thereby preventing their entry or assisting their control respectively. In many instances, there is no feasible alternative to this testing regime. Where possible, imported plants are sourced from registered pathogen-free stocks. However, there will always be a need to audit imports of such plants to ensure their health. In some instances, it may be possible to send diseased material overseas for testing. However, such facilities frequently do not exist and if they do their prohibitive cost prevents their general use. Moreover, New Zealand has little or no control over the priority accorded to the samples sent or over the quality of testing applied. Failure to protect New Zealand's biosecurity would have serious economical, political and social implications.

Organism details

5. The identification of the organism:

This should include all information necessary to identify the organism and should include:

- the taxonomic classification and name of the organism;
- the essential characteristics that identify the organism and its behaviour in the environment;
- sufficient information to enable the Authority to uniquely identify the organism in the register as required by section 20(2)(b) of the Act.

(This section may also include the name by which the organism is generally known.)

The information in this section would include, for example, information on the habitat range and climatic sensitivity of the organism. References to the scientific literature supporting this information should be given here if appropriate.

In the separate box below the applicant should provide the name of the organism suitable for inclusion in the Authority's public register.

Information that is commercially sensitive should be clearly identified. If supplied separately, a cross-reference to it should be included.

Taxonomic Name: Those plant virus and viroid species described by van Regenmortel et al. (2000) which were not present in New Zealand prior to the commencement of the HSNO Act, that is approximately 800 viral and 30 viroid species.

Characteristics: Plant viruses and viroids

[No] further information [No] commercially sensitive information

Name of the organism that may be used for the Authority's public register:

Plant virus and viroid species described by van Regenmortel et al. (2000) not present in New Zealand prior to the commencement of the HSNO Act.

6. If the organism is a genetically modified organism, information on the details of the genetic modifications:

This information shall include full details of the genetic constructs and modifications and the source and characteristics of the foreign nucleic acid.

This information should clearly identify the source of the donor genetic material and the characteristics. The desired characteristic (eg, herbicide resistance) and any other significant characteristics that may be expressed by the donor genetic material in the organism should be described.

Information on the stability and homogeneity of the construct should be given, if known. If this information is not known then this should be explicitly stated. References to the scientific literature supporting this information should be given here if appropriate.

Information that is commercially sensitive should be clearly identified. If supplied separately a cross-reference to it should be included.

[Yes] further information [No] commercially sensitive information

None of the organisms included in this application are genetically modified.

7. The reason why an application is necessary for the organism:

Refer to the definitions set out in Section 2 of the Act, to the prohibited organisms in the Second Schedule of the Act, and for genetically modified organisms, to the exemptions in the HSNO (Organisms Not Genetically Modified) Regulations 1998.

The organisms to which this application relates are new organisms as defined by the Hazardous Substances and New Organisms Act, 1996 and amended by the Hazardous Substances and New Organisms Amendment Act, 1999.

8. The purposes for which an approval is sought:

Reference should be made to the purposes specified in section 39(1) of the Act and the information should also provide sufficient details on the purpose of the application to enable the Authority to provide the information required in the register (under section 20(2)(c) of the Act).

The information in this section should be as expansive as possible. While the applicant may have only one potential use in mind, an approval would enable other uses as well. To enable the Authority to have access to all relevant information all the potential uses of the organism should be provided. The information on how well the organism performs these uses is necessary to enable the Authority to determine the performance characteristics of the organism.

Information that is commercially sensitive should be clearly identified. If it is supplied separately a cross-reference to it should be included.

[Yes] further information [No] commercially sensitive information

This application seeks approval to import the described organisms into containment for the purposes of maintaining new organisms for diagnostic purposes as specified in section 39 (1) sub-sections (c) of the HSNO Act.

Provide in this box a statement describing the purpose for making the application. This statement may be included in the Authority's public register (please use a maximum of 255 characters):

To import plant viruses and viroids not present in New Zealand in an inactive form into containment, in order to develop diagnostic tests and act as reference material during testing, thereby ensuring maintenance of New Zealand's biosecurity.

9. Information on any likely inseparable organisms:

Information should be provided on any organism which is unable to be separated from any new organism at the time of making the application. Examples may include foot and mouth and scrapie causing organisms in animals and viruses in plants.

[Yes] further information

All plant viruses and viroids are obligate parasites and therefore for practical reasons must be imported within plant tissue. However, the plant tissue (generally roots or leaves) will itself be non-viable, having been preserved either by drying or freeze-drying, and ground to a powder.

The majority of plant viruses, *c*. 90 %, are transmitted by a vector, most frequently by insects (90 %) or less commonly by mites (2 %), nematodes (4 %) or fungi (4 %) (Brunt *et al*., 1996). There are no inseparable organisms where the virus has no vector, and insect, mite and nematode vectors can be easily excluded from dried, ground plant material. However, for those c. 25-30 plant viruses transmitted by fungi (those in the genera *Benyvirus*, *Bymovirus*, *Furovirus*, *Necrovirus*, *Pecluvirus*, *Pomovirus* and *Varicosavirus*) (Brunt *et al*., 1996; Campbell, 1996), the vector may form resistant resting spores which can survive drying/freezing and grinding. However, the contaminating fungus only infects the roots of host plants whereas the virus infects both the aerial and subterranean parts. Therefore the virus can be excluded by only importing virus-infected leaves for these species.

The majority of plant viroids are transmitted by vegetative propagation, most are also transmitted mechanically and some are also seed- and/or pollen-borne. Only one, *Tomato planta macho viroid* is efficiently transmitted by an insect (Galindo *et al*., 1982; van Regenmortel *et al*., 2000). As for viruses which have similar modes of transmission, there are no inseparable organisms where the virus has no vector, and insect vectors can be easily excluded from dried, ground plant material.

Assessment of Effects

The information to be provided in these sections should cover the assessment of effects (both adverse and positive) of the organism. Where appropriate these sections may be combined in section 13 below.

Effects should be clearly assessed where relevant, including details as to how the risks will be controlled by the proposed containment system. **Where these adverse effects are identified, in the first instance by the applicant, as being minor then these do not require in-depth assessment.**

10. Information on all the possible adverse effects of the organism on the environment:

This should include information on the effects of the organism on ecosystems, public health, and Maori culture and taonga. It should also include information relevant to the matters in sections 4, 5, 6, 7, 8, and 37 of the Act and any regulations made under section 41 of the Act. The assessment should identify and assess risks, costs and benefits.

The information should give particular regard to:

Environmental and ecosystem effects (section 6(a) and (b) of the Act)

- assessment of the known and possible adverse effects throughout the life cycle of the organism on the sustainability of native and valued introduced flora and fauna and on the intrinsic value of ecosystems. *[Include an assessment of the ability of the organism to establish an undesirable self-sustaining population and the ease with which the organism could be eradicated if it was established.]*

Public health effects (section 6(c) of the Act)

- assessment of the known and possible adverse effects throughout the life cycle of the organism on public health. *[Assessment should take account of aspects of public health and safety including, where appropriate, effects from occupational exposure and effects from environmental exposure to the organism.]*

Relationship of Maori with taonga (section 6(d) of the Act)

- assessment of the known and possible adverse effects throughout the life cycle of the organism on the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu, valued flora and fauna, and other taonga. [Include details of consultation (if any) carried out.]

The ability of the organism to escape from containment.

See section 13.

11. In the identification and assessment of risks, costs and benefits and other impacts, which may occur should the organism escape, include those matters set out below.

The information should comprise of the risks identified and include:

- the nature of the adverse effects of the organism.
- the probability of occurrence and the magnitude of each adverse effect.
- the risk assessed as a combination of the magnitude of the adverse effect and the probability of its occurrence.
- the options and proposals for managing the risks identified.
- the uncertainty bounds on the information contained in the assessment, expressed quantitatively where possible but otherwise through narrative statements.

The identification and assessment of costs and benefits required in each application must include.

- the nature of the costs and benefits associated with the proposed new organism and whether they are monetary or non-monetary;
- the magnitude or expected value of the costs and benefits and the uncertainty bounds on the expected value.

Relevant costs and benefits will be those which pertain to the New Zealand economy, society and environment and which would not arise if the application was not approved (ie the opportunity cost to New Zealand). They shall include the long term as well as short term, and consequential as well as direct costs and benefits.

The information on risks, costs and benefits shall include the distributional effects over time, space and groups in the community. It shall also include the uncertainty intervals associated with these estimates.

See section 13.

12. Information on the positive effects of the organism:

See section 13.

13. Assessment of effects

If the assessment of effects is combined into this section, applicants should clearly indicate how the information requirements in sections 10, 11 and 12 of this form are addressed.

[Yes] further information [No] commercially sensitive information

Information on all the possible adverse effects of the organism on the environment

No adverse public health, environmental or cultural effects are anticipated as a result of these organisms being imported into containment. None of the organisms are human or animal pathogens or pose a threat to human or animal health. No part of this work will have specific relevance to Maori or have any known or possible effect on the relationship of Maori with their taonga.

These organisms represent a negligible environmental risk. The viruses and viroids will only be imported in an "inactive" form in dead plant material and will be used only within the laboratory to ensure the correct performance of diagnostic tests. After use they will be destroyed by autoclaving or incineration as detailed in the MAF Biosecurity Authority Standard 154.03.02 "Containment Facilities for Microorganisms". **This application specifically excludes using the imported virus- and viroid- infected material to infect new, live plant hosts. If the conditions of a PC2 laboratory are followed, there is no possibility of escape from containment.**

Appendix 1 details whether the viruses included in this application are mechanically transmissible *in vivo* or *in vitro*. The majority of plant viruses (c. 90 %; Brunt *et al*., 1996) are transmitted *in vivo* by a vector and are either not transmitted mechanically (c. 25 % of all viruses) (*e.g*. *Beet pseudo yellows virus*, genus *Crinivirus*; Coffin & Coutts, 1990) or are only transmitted mechanically in the laboratory using specialized techniques and equipment to a restricted range of plant hosts (*e.g*. *Oat mosaic virus*, genus *Bymovirus*; MacFarlane *et al*., 1968). These viruses are described in Appendix 1 as being either "Not mechanically transmissible" or Mechanically transmissible *in vitro* only" respectively. If in the unlikely event the containment protocol were to fail and plant material infected with viruses which are "mechanically transmissible *in vitro* only" were to be released into the environment, there is no

possibility that they would be able to persist since they could not infect hosts in such a form. As described above, such viruses are only mechanically transmissible using specialized techniques and equipment (e.g. maceration of infected tissue in phosphate buffer containing carborundum powder) to a restricted range of plant hosts (e.g. *Chenopodium quinoa*, *Nicotiana bethamiana*). Natural vectors (insects, mites nematodes or fungi) can not acquire the virus from dead tissue. In many instances the vector does not occur in New Zealand (*e.g. Polymyxa betae - Beet necrotic yellow vein virus* (Pennycook, 1989) and *Myzus humuli - Plum pox virus* (PPIN, 2001)). However, it is not possible to generalise on the presence/absence of vectors in New Zealand for the c. 850 organisms in the application, especially as many of these have multiple vectors (*e.g*. *Beet yellows virus* is vectored by > 21 aphid *spp*. (Heathcote, 1988)).

Of the remaining 10 % of plant viruses which are not transmitted *in vivo* by a vector, the majority are only transmitted by vegetative propagation such as grafting (*e.g*. *Cherry A virus*, genus *Capillovirus*; Jelkmann, 1995). In common with the non-mechanically transmissible viruses, there is clearly no way in which such viruses could persist or multiply if containment were breached and they were released into the environment. However of the non-vectored viruses, there are 27 which are mechanically transmitted *in vivo* (Brunt *et al*., 1996). These species are detailed in Table 1 and the genera in which they occur are also described in Appendix 1.

Table 1: Viral species mechanically transmitted *in vivo* (Brunt *et al*., 1996) and their status in New Zealand.

Genus	Species	Present in New Zealand
Carmovirus	*Carnation mottle virus*	Yes (Pennycook, 1989)
	Melon necrotic spot virus	No
	Pelargonium flower break virus	No
	Pelargonium line pattern virus	No
	Turnip crinkle virus	No
Caulimovirus	*Peanut chlorotic streak virus*	No
Comovirus	*Potato Andean mottle virus*	No
Dianthovirus	*Carnation ringspot virus*	Yes (Pennycook, 1989)
Ilarvirus	*Lilac ring mottle virus*	No
Nucleorhabdovirus	*Pittosporum vein yellowing virus*	No
Potexvirus	*Burdock yellow mosaic virus*	No
	Cactus X virus	No
	Cymbidium mosaic virus	Yes (Pennycook, 1989)
	Potato X virus	Yes (Pennycook, 1989)
	White clover mosaic virus	Yes (Pennycook, 1989)
Potyvirus	*Tobacco vein mottling virus*	No
	Zucchini yellow fleck virus	No
Tobamovirus	*Maracuja mosaic virus*	No
	Pepper mild mottle virus	Yes (PPIN, 2001)
	Ribgrass mosaic virus	No
	Sunn-hemp mosaic virus	No
	Tobacco mosaic virus	Yes (Pennycook, 1989)
	Tomato mosaic virus	Yes (Pennycook, 1989)
	Ullucus mild mottle virus	No
Tombusvirus	*Cucumber necrosis virus*	No
	Cymbidium ringspot virus	No
Tymovirus	*Potato Andean latent virus*	No

The majority of plant viroids are transmitted by vegetative propagation *in vivo*, although most are also transmitted mechanically at least *in vitro* and some may also be mechanically transmitted *in vivo* albeit at a lower efficiency, *e.g*. *Hop latent viroid* (Adams *et al*., 1996). In general, the characteristics of plant viroid transmission are less well characterized than plant viruses and therefore all viroids imported under this application will be treated as if they are easily mechanically transmissible. The recognized species of plant viroid are listed in Table 2 and the genera in which they occur are also described in Appendix 2.

Table 2: The species of viroid (van Regenmortel *et al*., 2000) and their status in New Zealand.

Genus	Species	Present in New Zealand
Apscaviroid	*Apple dimple fruit viroid*	No
	Apple scar skin viroid	No
	Australian grapevine viroid	No
	Citrus viroid III	No
	Citrus bent leaf viroid	No
	Grapevine yellow speckle viroid 1	Yes (Pennycook, 1989)
	Grapevine yellow speckle viroid 2	Yes (Pennycook, 1989)
	Pear blister canker viroid	Yes (Pennycook, 1989)
Avsunviroid	*Avocado sunblotch viroid*	Yes (PPIN, 2001)
Cocadviroid	*Citrus viroid IV*	No
	Coconut cadang-cadang viroid	No
	Coconut tinangaja viroid	No
	Hop latent viroid	No
Coleviroid	*Coleus blumei viroid 1*	No
	Coleus blumei viroid 2	No
	Coleus blumei viroid 3	No
Hostuviroid	*Hop stunt viroid*	No
Pelamoviroid	*Chrysanthemum chlorotic mottle viroid*	No
	Peach latent mosaic viroid	No
Pospiviroid	*Chrysanthemum stunt viroid*	Yes (Pennycook, 1989)
	Citrus exocortis viroid	Yes (Pennycook, 1989)
	Columnea latent viroid	No
	Iresine viroid 1	No
	Mexican papita viroid	No
	Potato spindle tuber viroid	Yes (PPIN, 2001)
	Tomato apical stunt viroid	No
	Tomato planta macho viroid	No
Unassigned genus	*Apple fruit crinkle viroid*	No
	Blueberry mosaic viroid	No
	Burdock stunt viroid	No
	Eggplant latent viroid	No
	Nicotiana glutinosa stunt viroid	No
	Pigeon pea mosaic viroid	No
	Tomato bunchy top viroid	No

Eight of the viruses in Table 1 and seven of the viroids in Table 2 are already found in New Zealand. Furthermore *Cactus X virus* and *Ribgrass mosaic virus* have a worldwide distribution and are almost certainly in the country (Brunt *et al*., 1996). Therefore there are at most 19 (although most probably 17) viruses and 27 viroids which are "new organisms" and thus fall within the remit of the HSNO Act and this application. These viruses and viroids pose a small risk to the environment in the unlikely event that containment were breached, e.g. by improper disposal of contaminated gloves, since there is a remote possibility that a virus or viroid from this group could become established following such an event. However, in order to do so, the virus- or viroid-infected material would have to be physically abraded onto a susceptible host. All of these viruses and viroids have a limited host range of which only a restricted proportion occur in New Zealand.

All plant viruses and viroids are obligate parasites and therefore must be imported within plant tissue. The plant tissue (generally roots or leaves) will itself be non-viable, having been preserved either by drying or freeze-drying, and ground to a powder.

All material will be imported from either culture collections (including scientific companies) or recognized experts in the relevant field and will be identified to species level prior to importation. Each imported species will be clearly labelled and packaged so that containment may not be breached accidentally during transit. Reference material will be packaged in a sealed plastic test-tube, e.g. the 60 ml polycarbonate test-tube marketed by Dangerous Goods Management Ltd. (http://www.dgm.co.nz/) or equivalent. The test-tube will be placed within a strong plastic cylinder, e.g. the 0.5 l high-density polyethylene Bio-Bottle with a neoprene seal marketed by Dangerous Goods Management Ltd. or equivalent, cushioned by a suitable packaging material (e.g. polystyrene chips). Material in broken or inappropriate packaging will be destroyed at the border.

Once imported the following measures will be taken to minimize the risks associated with importing infected reference material:

i) all work will be carried in a PC2 registered laboratory (as defined by the AS/NZS 2243.3: 2001 standard "Safety in Laboratories, Part 3: Microbiology") in a containment facility which accords to the MAF Standard 154.03.02 "Containment Facilities for Microorganisms".

ii) the amount of each sample of virus- or viroid-infected material will be limited to 1 gramme

iii) all virus- and viroid-infected samples will be kept in double-sealed containers and when not in use will be stored in a locked metal cabinet.

iv) a register will be kept of all samples imported, to include the number of importations, their identity, origin (source, country) and fate.

v) no live plants will be permitted in laboratories registered to use or store virus/viroid-infected material.

To further reduce the possibility of the 19 easily mechanically transmissible viruses and 27 viroids being released into the environment, samples of these organisms will only be permitted into New Zealand for defined and time-limited diagnostic purposes as outlined in section 8. Upon completion of the work, the samples will be disposed of by autoclaving or incineration as detailed in the MAF Standard 154.03.02 "Containment Facilities for Microorganisms". For the remainder of the organisms, samples of infected but inactive material will be stored as detailed in i) to vi) above. As described in v), a register will be kept of all samples of reference material imported, if required a copy of this register will be sent annually to the Authority.

The need to diagnose plant viruses and viroids is an ongoing requirement for import and surveillance programmes and therefore an "open-ended approval" is sought for this activity. Reference material will only be imported into the country as required. The scope of this application does not include culture collections and no material will be imported to be held in such a permanent repository. However, infected reference material will need to be kept in storage where there is an ongoing requirement for access to such material, e.g. import programmes for specific commodities. Furthermore, some reference material may be expensive to purchase (e.g. virus-infected reference material from the American Type Culture Collection (http://www.atcc.org/) cost US$107 (NZ$256) each) and/or difficult to obtain because it is not commercially available or only available seasonally. Of the *c*. 850 organisms in the application, it is estimated that no one organisation would need to import samples of more than *c*. 50-100 viruses and/or *c*.10-20 viroids at most. Of these c. 100 organisms, it is likely that perhaps up to half may be kept in storage for approximately one year.

This application has been prepared to enable the MAF National Plant Pest Reference Laboratory (NPPRL) to import virus- and viroid-infected plant samples for use as reference material during diagnostic testing and to enable the development and assessment of new diagnostic tests. However, it is anticipated that approval for this activity will enable other organisations (e.g. crown research institutes, universities) to import such material provided that they can meet the containment requirements described in this application. The NPPRL operates on two sites, Lincoln (Christchurch) and Lynfield (Auckland). Both sites have been approved as containment facilities according to the MAF Standard 154.03.02 "Containment Facilities for Microorganisms" pursuant to sections 39 and 40 of the Biosecurity Act, 1993 (Appendix 9). The Lynfield and Lincoln sites contain PC1 and PC2 registered laboratories respectively, as defined by the AS/NZS 2243.3: 2001 standard "Safety in Laboratories, Part 3: Microbiology" Appendix 10). Registration of laboratories to the PC2 standard at the Lynfield site is actively being sought. As described in this application, infected material will only be imported into containment into a PC2 registered laboratory and therefore no such material will be imported into the Lynfield site until this standard is met.

Identification and assessment of risks, costs and benefits and other impacts which may occur as a result of the release of the organism

The risks associated with this proposal are negligible for the reasons described in the previous section, that is, with the exception of the 19 easily mechanically transmissible viruses and 27 viroids identified in the previous section (Tables 1 and 2), none of the viruses have any means of active dispersal or infection of new hosts and therefore can not survive in the environment. The risks associated with the easily mechanically transmissible viruses and viroids are very low and will be further reduced by a) only importing samples for a limited time for defined purposes, e.g. during an outbreak situation or to develop/optimize diagnostic methods for pathogens of economic importance, and b) not allowing storage of such material. As described above, the samples will be destroyed upon completion of the work.

It is difficult to generalise on the impacts that the viruses and viroids included in this application would have if released in an active state into New Zealand since the impact of these *c*. 830 organisms varies hugely in their native environments. Since they are new organisms as defined by the HSNO Act, MAF also defines them as regulated organisms for which phytosanitary actions would be undertaken if they were intercepted/detected. MAF sub-divides regulated organisms into three risk groups according to their potential impact (see glossary, section 19). None of the organisms in this application are defined as Risk Group 3 pests, that is the most economically damaging pests. Six viruses are defined as Risk Group 2 pests which if introduced could cause a major disruption to market access and/or significant economic impacts on the production of a particular commodity/commodities and/or the environment (Table 3, Appendix 3). The remainder of the *c*. 830 organisms are either uncategorized or classified as Risk Group 1 pests (Table 3, Appendix 3 and 4). The latter group of pests could cause unacceptable economic impacts on the production of a commodity/ commodities and/or the environment.

Since the potential impact of some of the organisms in this application has not been assessed by MAF, the quarantine species of virus and viroid of potential economic importance by EPPO are listed in Appendix 5 and 6. EPPO considers 38 quarantine viruses and 3 viroids to be of potential economic importance, many of these pathogens are considered to be RG 1 and 2 pests by MAF.

Although the potential impact of these organisms cannot be generalised, even if containment were breached these organisms would not be released in an active state, as described in the preceding section. The viruses and viroids will only be imported in dead plant material which generally is either totally uninfectious or can only infect a restricted range of plant hosts using specialized techniques and equipment. If in the unlikely event the containment protocol were to fail and such material were released into the environment, they could not persist since they could not infect hosts in this form (either because the vector is not present or if it is present, because it can not acquire the pathogen from dead plant material). Even for the remaining viroids and viruses which are easily mechanically transmissible and could be transmitted *in vivo*, the infected material would have to be physically abraded onto a susceptible host. All of these viruses and viroids have a limited host range of which only a restricted proportion occur in New Zealand.

Table 3: The potential impact associated with the importation of reference material of viruses and viroids not present in New Zealand prior to the commencement of the HSNO Act

	Not mechanically transmissible (No viable organism)	Mechanically transmissible *in vitro* only	Mechanically transmissible *in vitro* and *in vivo*
Uncategorized	*c*. 170 viruses, 0 viroids	*c*. 460 viruses, 0 viroids	13 viruses, 22 viroids
Risk Group 1	*c*. 30 viruses, 0 viroids	*c*. 120 viruses, 0 viroids	4 viruses, 5 viroids
Risk Group 2	None	4 viruses, 0 viroids	2 viruses, 0 viroids
Risk Group 3	None	None	None

Data from Brunt *et al*. (1996) and van Regenmortel *et al*. (2000).

Two examples are given to illustrate the variation in the likely significance of these organisms being introduced in an **active** state, *e.g*. by importing infected budwood or vectors harbouring the pathogen (this application covers the importation of viruses and viroids in an **inactive** state in dead plant material only). *Beet 1 virus* and *Beet 2 virus* (genus *Alphacryptovirus*) only infect *Beta vulgaris* and generally have no affect on plant growth or yield (Xie *et al*., 1994). By contrast, *Plum pox virus* naturally infects at least 30 species and decreases stonefruit yield by more than 80 % (Nemeth, 1994). Exports alone of these fruits were worth $NZ 14.7 million in the year to June 2000 (Smales & Elliott, 2001). Such economic effects would also have considerable social and political impacts.

Previous to the implementation of the relevant part of the HSNO Act on 29 July 1998, MAF allowed the importation of such virus- and viroid-infected reference material for use in diagnosis. Such importations were controlled by the use of permits which detailed the precautions and restrictions which applied to the use of such material. The permits issued for the six months prior to the commencement of the act are detailed in Appendix 7. These permits allow the importation of some 180 viruses and 4 viroids, the majority into the Plant Protection Centre (which upon

restructuring in November 1998 became the NPPRL). The NPPRL (and its predecessors) has imported such infected material in an inactive state for at least the last twenty years and there is no record of any breach of containment, let alone any "escape" or establishment in the environment. Since the implementation of the HSNO Act, MAF has continued to allow, under permit, the importation of both non-viable virus- and viroid-infected reference material and viable material infected with regulated strains of viruses and viroids present in the country prior to the commencement of the act. No viable virus- and viroid-infected material of species not present prior to this time has been allowed to be imported and this has proved to be a serious restraint on the NPPRL's ability to diagnose such pathogens.

There are not likely to be any positive effects of any of the organisms described in this application *per se*. However, access to such reference virus- and viroid-infected material will significantly improve New Zealand's ability to identify exotic plant pathogens in quarantine or surveillance samples thereby preventing their entry or assisting their control by:

1. Avoiding "false negatives" during diagnostic testing by providing confirmation of test performance.
2. Developing/assessing diagnostic tests.

It is necessary to have reference samples of virus- and viroid-infected material to ensure the correct performance of diagnostic tests. The potential economic cost of these organisms "escaping" into the environment in an active state is balanced by the benefit of having access to such material during diagnostic testing. That is, the more potentially costly a virus or viroid might be if introduced into New Zealand, the more important (and beneficial) it is to have access to a reference sample of the organism for quarantine or surveillance programmes.

The NPPRL is the main organisation carrying out testing of imported and surveillance plant material for the presence of plant viruses and viroids in New Zealand. In many instances, there is no feasible alternative to this testing regime. Where possible, imported plants are sourced from registered pathogen-free stocks. However, there will always be a need to audit imports of such plants to ensure their health. In some instances, it may be possible to send diseased material overseas for testing. However, such facilities frequently do not exist and if they do their prohibitive cost prevents their general use. Moreover, New Zealand has little or no control over the priority accorded to the samples sent or over the quality of testing applied.

Containment System

14. Information about proposed containment system:

Provide information on how it is proposed that the organism be adequately contained including how the proposed containment system conforms to the requirements of the Parts I and II of the Third Schedule of the Act as appropriate.

This may include reference to, and outlines of, appropriate standards and codes of practice.

[Yes] further information

The organisms to which this application refers are classified as "new organisms" by the HSNO Act and thus, as provided for by the act, will be imported into a containment facility which accords to the MAF Standard 154.03.02 "Containment Facilities for Microorganisms". All diagnostic work conducted using these organisms will be carried out in a PC2 registered laboratory (as defined by the AS/NZS 2243.3: 2001 standard "Safety in Laboratories, Part 3: Microbiology") operated within this containment facility.

This application seeks permission for laboratories carrying out diagnostic tests on quarantine and surveillance samples to import identified species of plant viruses and viroids not present in New Zealand in an inactive form into containment. The most important organisation currently carrying out such work is the National Plant Pest Reference Laboratory (Lynfield, Auckland). Similar work, though on a smaller scale focussed on particular commodities (e.g. importations of potato and stonefruit nursery stock), is also being carried out by two crown research institutes, the Horticulture and Food Research Institute of New Zealand Ltd. (Auckland and Havelock North) and the New Zealand Institute for Crop & Food Research Ltd. (Lincoln), and the University of Auckland, Auckland. This situation is unlikely to change significantly in the foreseeable future, although MAF is aware that a few organisations, namely Riversun Nurseries, (Gisborne), Massey University (Palmerston North) and the University of Otago (Dunedin) may wish to conduct such work on a small scale in the future. It is likely that the NPPRL would wish to import reference samples of no more than 50-100 viruses and/or 10-20 viroids. The remaining organisations would be likely to import much fewer samples, perhaps 5-20 viruses and/or 2-5 viroids per organisation.

International and related matters

15. Information on all occasions where the organism has been considered by the government of any prescribed State or country or by any prescribed organisation and the results of such consideration: Where no countries or organisations are prescribed by regulations made under section 140(1)9k) of the Act, this section can be omitted.

If the applicant is aware that the organism has previously been considered by, for example, any OECD or APEC country, information on the nature of that consideration, including the result, should be provided if known.

[No] further information

16. Information on New Zealand's international obligations that may be relevant to the application:

Where the applicant is aware that New Zealand's international obligations may be relevant to the application, indicate the nature of the obligation and the effect this may have on the application.

If the applicant is aware of obligations such as the WTO Agreements, the Convention on International Trade in Endangered Species (CITES), Trans Tasman Mutual Recognition Agreement and the like that may be relevant to the application, then information on these obligations should be provided, if known.

[No] further information

Previous considerations

17. If the application relates to an organism that has been previously considered by the Advisory Committee on Novel Genetic Techniques or the Minister for the Environment on the recommendation of the Interim Assessment Group, details of the consideration and its results:

[No] further information

Other relevant legislation

18. Information on other legislation relevant to the organism and its use throughout its life cycle.

If the organism is also subject to other legislation (eg. an Import Health Standard under the Biosecurity Act 1993, or resource consent under the Resource Management Act 1991), details should be provided.

[Yes] further information

Many of the economically important organisms included in this application are regulated by Import Health Standards under section 22 of the Biosecurity Act, 1993.

Glossary

19. A glossary of scientific and technical terms used in the application.

This may be appended to the application on a separate form if desired.

[No] further information

Definitions of the Ministry of Agriculture and Forestry (MAF):

1. Regulated organisms are those organisms for which phytosanitary actions would be undertaken if they were intercepted/detected. These include new organisms as defined by the HSNO Act. MAF sub-divides regulated organisms into the following groups according to their potential impact:

2. Risk group 1 pests are those regulated pests which on introduction into New Zealand could cause unacceptable economic impacts on the production of a commodity/commodities and/or the environment.

3. Risk group 2 pests are those regulated pests which on introduction into New Zealand could cause a major disruption to market access (some importing countries require specific pre-export phytosanitary treatments) and/or significant economic impacts on the production of a particular commodity/commodities and/or the environment.

4. Risk group 3 pests (e.g. economically significant species of fruit flies) are those regulated pests which on entry into New Zealand would cause a major disruption to market access for a wide range of New Zealand commodities and/or have significant economic impacts on their production and/or the environment (some importing countries prohibit the entry of the host commodity). An official surveillance system is required for such pests in New Zealand

Definitions of the European and Mediterranean Plant Protection Organisation (EPPO):

A1 pest (for an area) is a quarantine pest not present in that area.

A2 pest (for an area) is a quarantine pest present in that area but not widely distributed there and being officially controlled.

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.

Other relevant information

20. Provide here any other information required by the Act or regulations not included under any other section of this form.

[No] further information

[No] commercially sensitive information

Summary of Application Contents

(Please check the application is complete and identify attachments)

[Yes] Fees enclosed

[Yes] Assessment of effects included

[No] Confidential information supplied

[Yes] Signed and dated

[Yes] Appendices attached and cross-referenced (list below)

Appendix 1: Plant viral families and genera containing species which are required for importation into containment as reference material during diagnostic testing.

Appendix 2: Plant viroid familes (in bold) and genera containing species which are required for importation into containment as reference material during diagnostic testing.

Appendix 3: Plant virus species defined as Risk group (RG) 1 or 2 pests familes which are required for importation into containment as reference material during diagnostic testing.

Appendix 4: Plant viroid species defined as Risk group (RG) 1 or 2 pests familes which are required for importation into containment as reference material during diagnostic testing.

Appendix 5: Plant virus species defined as A1 or A2 quarantine pests by EPPO which are required for importation into containment as reference material during diagnostic testing.

Appendix 6: Plant viroid species defined as A1 or A2 quarantine pests by EPPO which are required for importation into containment as reference material during diagnostic testing.

Appendix 7: Plant permits issued by MAF for the importation of reference material ("positive controls") of plant viruses and viroids not present in New Zealand in an inactive state into containment – 1 January-29 July 1998

Appendix 8: References

Appendix 9: Certificates of approval of containment facility

Appendix 10: Containment manuals

Signature of applicant or person authorised on behalf of applicant _____ **Date:**

20 Customhouse Quay,
Cnr Waring Taylor & Customhouse Quay
PO Box 131, Wellington
Phone: 04-473 8426 Fax: 04-473 8433
Email: enquiries@ermanz.govt.nz
Website: www.ermanz.govt.nz

ENVIRONMENTAL RISK MANAGEMENT AUTHORITY
NGĀ KAIWHAKATŪPATO WHAKARARU TAIAO

ERMA New Zealand

Appendix 1: Plant viral families (in bold) and genera containing species (official, *tentative*) which are required for importation into containment as reference material during diagnostic testing.

1. *Bromoviridae*			
Alfamovirus	Mechanically transmissible *in vitro* only	1	*0*
Bromovirus	Mechanically transmissible *in vitro* only	6	*0*
Cucumovirus	Mechanically transmissible *in vitro* only	3	*0*
Ilarvirus	Mechanically transmissible *in vivo* and/or *in vitro*	17	*0*
Oleavirus	Mechanically transmissible *in vitro* only	1	*0*
2. *Bunyaviridae*			
Tospovirus	Mechanically transmissible *in vitro* only	8	*5*
3. *Caulimoviridae*			
Badnavirus	Mechanically or not mechanically transmissible *in vitro* only	12	*4*
Caulimovirus	Mechanically transmissible *in vivo* and/or *in vitro*	9	*4*
"CsVMV-like"	Mechanically transmissible *in vitro* only	1	*0*
"PVCV-like"	Not mechanically transmissible	1	*0*
"RTBV-like"	Not mechanically transmissible	1	*0*
"SbCMV-like"	Mechanically transmissible *in vitro* only	2	*0*
4. *Closteroviridae*			
Crinivirus	Not mechanically transmissible	7	*0*
Closterovirus	Mechanically or not mechanically transmissible *in vitro* only	11	*16*
5. *Comoviridae*			
Comovirus	Mechanically transmissible *in vivo* and/or *in vitro*	15	*0*
Fabavirus	Mechanically transmissible *in vitro* only	4	*0*
Nepovirus	Mechanically transmissible *in vitro* only	31	*9*
6. *Geminiviridae*			
Begomovirus	Mechanically or not mechanically transmissible *in vitro* only	76	*8*
Curtovirus	Mechanically or not mechanically transmissible *in vitro* only	3	*1*
Mastrevirus	Not mechanically transmissible	12	*2*
7. *Luteoviridae*			
Enamovirus	Mechanically transmissible *in vitro* only	1	*8*
Luteovirus	Not mechanically transmissible	2	*1*
Polerovirus	Not mechanically transmissible	5	*2*
Unassigned genus	Not mechanically transmissible	11	*1*
8. *Partitiviridae*			
Alphacryptovirus	Mechanically or not mechanically transmissible *in vitro* only	16	*10*
Betacryptovirus	Not mechanically transmissible	4	*1*
9. *Potyviridae*			
Bymovirus	Mechanically transmissible *in vitro* only	6	*0*
Ipomovirus	Mechanically transmissible *in vitro* only	1	*1*
Macluravirus	Mechanically transmissible *in vitro* only	2	*0*
Potyvirus	Mechanically or not mechanically transmissible *in vivo* and/or *in vitro*	91	*90*
Rymovirus	Mechanically transmissible *in vitro* only	4	*1*
Tritimovirus	Mechanically transmissible *in vitro* only	2	*0*
10. *Reoviridae*			
Fijivirus	Mechanically or not mechanically transmissible *in vitro* only	7	*0*
Oryzavirus	Mechanically or not mechanically transmissible *in vitro* only	2	*0*
Phytoreovirus	Not mechanically transmissible	3	*1*
11. *Rhabdoviridae*			
Cytorhabdovirus	Mechanically or not mechanically transmissible *in vitro* only	8	*0*
Nucleorhabdovirus	Mechanically or not mechanically transmissible *in vivo* and/or *in vitro*	7	*0*
Unassigned genus	Mechanically or not mechanically transmissible *in vitro* only	58	*0*
12. *Sequiviridae*			
Sequivirus	Mechanically transmissible *in vitro* only	2	*0*
Waikavirus	Not mechanically transmissible	3	*0*

13. *Tombusviridae*			
Aureusvirus	Mechanically transmissible *in vitro* only	1	*0*
Avenavirus	Mechanically transmissible *in vitro* only	1	*0*
Carmovirus	Mechanically transmissible *in vivo* and/or *in vitro*	13	*6*
Dianthovirus	Mechanically transmissible *in vivo* and/or *in vitro*	3	*1*
Machlomovirus	Mechanically transmissible *in vitro* only	1	*0*
Necrovirus	Mechanically transmissible *in vitro* only	5	*2*
Panicovirus	Mechanically transmissible *in vitro* only	1	*1*
Tombusvirus	Mechanically transmissible *in vivo* and/or *in vitro*	13	*0*
Unassigned genus	Mechanically transmissible *in vitro* only	1	*0*
14. *Unassigned family*			
Allexivirus	Mechanically transmissible *in vitro* only	7	*3*
Benyvirus	Mechanically transmissible *in vitro* only	2	*0*
Capillovirus	Mechanically transmissible *in vitro* only	3	*1*
Carlavirus	Mechanically or not mechanically transmissible *in vitro* only	31	*29*
Foveavirus	Mechanically transmissible *in vitro* only	2	*1*
Furovirus	Mechanically transmissible *in vitro* only	1	*4*
Hordeivirus	Mechanically transmissible *in vitro* only	4	*0*
Idaeovirus	Mechanically transmissible *in vitro* only	1	*0*
Marafivirus	Not mechanically transmissible	3	*0*
Nanovirus	Not mechanically transmissible	4	*1*
Ophiovirus	Mechanically transmissible *in vitro* only	3	*0*
Ourmiavirus	Mechanically transmissible *in vitro* only	3	*0*
Pecluvirus	Mechanically transmissible *in vitro* only	2	*0*
Pomovirus	Mechanically transmissible *in vitro* only	4	*0*
Potexvirus	Mechanically or not mechanically transmissible *in vivo* and/or *in vitro*	26	*19*
Sobemovirus	Mechanically transmissible *in vitro* only	11	*3*
Tenuivirus	Mechanically or not mechanically transmissible *in vitro* only	6	*5*
Tobamovirus	Mechanically transmissible *in vivo* and/or *in vitro*	16	*1*
Tobravirus	Mechanically transmissible *in vitro* only	3	*0*
Trichovirus	Mechanically or not mechanically transmissible *in vitro* only	3	*0*
Tymovirus	Mechanically transmissible *in vivo* and/or *in vitro*	21	*2*
Umbravirus	Mechanically transmissible *in vitro* only	7	*4*
Varicosavirus	Mechanically or not mechanically transmissible *in vitro* only	1	*3*
Vitivirus	Mechanically transmissible *in vitro* only	4	*1*
Unassigned genus	Mechanically or not mechanically transmissible *in vitro* only	15	*0*

Data from Brunt *et al*. (1996), van Regenmortel *et al*. (2000) and Mayo & Brunt (2001).

Appendix 2: Plant viroid familes (in bold) and genera containing species which are required for importation into containment as reference material during diagnostic testing.

1. *Pospiviroidae*			
Apscaviroid	Mechanically transmissible *in vivo* and/or *in vitro*	8	*0*
Cocadviroid	Mechanically transmissible *in vivo* and/or *in vitro*	4	*0*
Coleviroid	Mechanically transmissible *in vivo* and/or *in vitro*	3	*0*
Hostuviroid	Mechanically transmissible *in vivo* and/or *in vitro*	1	*0*
Pospiviroid	Mechanically transmissible *in vivo* and/or *in vitro*	8	*0*
2. *Avsunviroidae*			
Avsunviroid	Mechanically transmissible *in vivo* and/or *in vitro*	1	*0*
Pelamoviroid	Mechanically transmissible *in vivo* and/or *in vitro*	2	*0*
3. *Unassigned family*			
Unassigned genus	Mechanically transmissible *in vivo* and/or *in vitro*	7	*0*

Data from van Regenmortel *et al*. (2000) and Mayo & Brunt (2001).

Appendix 3: Plant virus species defined as Risk group (RG) 1 or 2 pests by MAF which are required for importation into containment as reference material during diagnostic testing.

1. *Bromoviridae*		
Alfamovirus	None	--
Bromovirus	*Broad bean mottle virus*	RG 1
	Brome mosaic virus	RG 1
Cucumovirus	*Peanut stunt virus*	RG 1
Ilarvirus	*Blueberry necrotic shock virus*	RG 1
	Citrus leaf rugose virus	RG 1
	Grapevine line pattern virus	RG 1
	Humulus japonicus virus	RG 1
	Hydrangea mosaic virus	RG 1
	Lilac ring mottle virus	RG 1
	Sunflower ringspot virus	RG 1
	Tulare apple mosaic virus	RG 1
Oleavirus	*Olive latent 2 virus*	RG 1
2. *Bunyaviridae*		
Tospovirus	*Groundnut ringspot virus*	RG 1
	Impatiens necrotic spot virus	RG 1
3. *Caulimoviridae*		
Badnavirus	*Canna yellow mottle virus*	RG 1
	Citrus yellow mosaic virus	RG 1
	Rubus yellow net virus	RG 1
	Sweet potato leaf curl virus	RG 1
	Yam internal brown spot virus	RG 1
Caulimovirus	*Blueberry red ringspot virus*	RG 1
	Dahlia mosaic virus	RG 1
	Strawberry vein banding virus	RG 1
"CsVMV-like"	None	--
"PVCV-like"	None	--
"RTBV-like"	None	--
"SbCMV-like"	None	--
4. *Closteroviridae*		
Crinivirus	*Lettuce infectious yellows virus*	RG 1
	Tomato infectious chlorosis virus	RG 1
	Sweet potato sunken vein virus	RG 1
Closterovirus	*Carrot yellow leaf virus*	RG 1
	Peach yellow leaf virus	RG 1
	Pineapple wilt-associated virus	RG 1
5. *Comoviridae*		
Comovirus	*Broad bean stain virus*	RG 1
	Broad bean true mosaic virus	RG 1
	Cowpea severe mosaic virus	RG 1
	Potato Andean mottle virus	RG 2
	Red clover mottle virus	RG 1
Fabavirus	*Broad bean wilt virus*	RG 1

Nepovirus	*Artichoke Italian latent virus*	RG 1
	Artichoke yellow ringspot virus	RG 1
	Blueberry leaf mottle virus	RG 1
	Cacao necrosis virus	RG 1
	Cycas necrotic stunt nepovirus	RG 1
	Grapevine Bulgarian latent virus	RG 1
	Grapevine chrome mosaic virus	RG 1
	Myrobalan latent ringspot virus	RG 1
	Olive latent ringspot virus	RG 1
	Peach enation virus	RG 1
	Potato black ringspot virus	RG 2
	Potato U virus	RG 1
	Raspberry ringspot virus	RG 1
	Rubus Chinese seedborne virus	RG 1
	Satsuma dwarf virus	RG 1
	Sweet potato ringspot virus	RG 1
	Tomato black ring virus	RG 1
6. *Geminiviridae*		
Begomovirus	*Potato yellow mosaic virus*	RG 1
	Solanum apical leaf curling virus virus	RG 1
	Squash leaf curl virus	RG 1
	Tobacco Indian leafcurl virus	RG 1
	Tomato yellow leaf curl virus	RG 1
	Tomato yellow mosaic virus	RG 1
Curtovirus	*Beet curly top virus*	RG 1
Mastrevirus	*Maize streak virus*	RG 1
7. *Luteoviridae*		
Enamovirus	*Pea enation mosaic virus*	RG 1
Luteovirus	*Grapevine Ajinashika disease virus*	RG 1
	Raspberry leaf curl virus	RG 1
Polerovirus	None	--
8***. Partitiviridae***		
Alphacryptovirus	*Carrot temperate 1 virus*	RG 1
	Carrot temperate 2 virus	RG 1
	Carrot temperate 3 virus	RG 1
	Carrot temperate 4 virus	RG 1
	Radish yellow edge virus	RG 1
Betacryptovirus	*White clover 2 virus*	RG 1
9. *Potyviridae*		
Bymovirus	None	--
Ipomovirus	*Sweet potato mild mottle virus*	RG 1
	Sweet potato yellow dwarf virus	RG 1
Macluravirus	*Narcissus latent virus*	RG 1

Potyvirus	*Alstroemeria mosaic virus*	RG 1
	Asparagus 1 virus	RG 1
	Bramble yellow mosaic virus	RG 1
	Carrot mosaic virus	RG 1
	Carrot thin leaf virus	RG 1
	Guinea grass mosaic virus	RG 1
	Hippeastrum mosaic virus	RG 1
	Hyacinth mosaic virus	RG 1
	Narcissus degeneration virus	RG 1
	Narcissus late season yellows virus	RG 1
	Ornithogalum mosaic virus	RG 1
	Papaya ringspot virus	RG 1
	Peanut mottle virus	RG 1
	Plum pox virus	RG 2
	Potato V virus	RG 1
	Shallot yellow stripe virus	RG 1
	Statice Y potyvirus	RG 1
	Sunflower mosaic virus	RG 1
	Sweet potato G virus	RG 1
	Sweet potato latent virus	RG 1
	Sweet potato vein mosaic virus	RG 1
	Tulip chlorotic blotch virus	RG 1
	Watermelon Moroccan mosaic virus	RG 1
	Watermelon mosaic 1 virus	RG 1
	Zucchini yellow mosaic virus	RG 1
Rymovirus	*Wheat streak mosaic virus*	RG 1
Tritimovirus	None	--
10. *Reoviridae*		
Fijivirus	None	--
Oryzavirus	None	--
Phytoreovirus	None	--
11. *Rhabdoviridae*		
Cytorhabdovirus	*Citrus leprosis virus*	RG 1
	Pineapple chlorotic leaf streak virus	RG 1
	Strawberry latent C rhabdovirus	RG 1
Nucleorhabdovirus	*Carrot latent virus*	RG 1
	Cereal chlorotic mottle virus	RG 1
	Cynodon chlorotic streak virus	RG 1
	Eggplant mottled dwarf virus	RG 1
	Gomphrena virus	RG 1
	Maize mosaic virus	RG 1
	Potato yellow dwarf virus	RG 1
	Wheat American striate mosaic virus	RG 1
12. *Sequiviridae*		
Sequivirus	*Parsnip yellow fleck virus*	RG 1
Waikavirus	*Maize chlorotic dwarf virus*	RG 1

13. *Tombusviridae*		
Aureusvirus	None	--
Avenavirus	None	--
Carmovirus	*Cucumber leaf spot virus*	RG 1
	Cucumber soil-borne virus	RG 1
	Narcissus tip necrosis virus	RG 1
	Turnip crinkle virus	RG 1
Dianthovirus	None	--
Machlomovirus	*Maize chlorotic mottle virus*	RG 1
Necrovirus	None	--
Panicovirus	None	--
Tombusvirus	*Carnation Italian ringspot virus*	RG 1
	Cymbidium ringspot virus	RG 1
	Grapevine Algerian latent virus	RG 1
	Petunia asteroid mosaic virus	RG 1
	Tomato bushy stunt virus	RG 1
14. *Unassigned family*		
Allexivirus	None	--
Benyvirus	None	--
Capillovirus	*Lilac chlorotic leaf spot virus*	RG 1
Carlavirus	*Aster chlorotic stunt virus*	RG 1
	Blueberry scorch virus	RG 1
	Helleborus mosaic virus	RG 1
	Hydrangea latent virus	RG 1
	Pea streak virus	RG 1
	Red clover vein mosaic virus	RG 1
	Shallot latent virus	RG 1
	Strawberry pseudo mild yellow edge virus	RG 1
Foveavirus	None	--
Furovirus	None	--
Hordeivirus	None	--
Idaeovirus	None	--
Marafivirus	*Oat blue dwarf virus*	RG 1
Nanovirus	None	--
Ophiovirus	None	--
Ourmiavirus	*Pelargonium zonate spot virus*	RG 1
Pecluvirus	*Peanut clump virus*	RG 1
Pomovirus	*Potato mop-top virus*	RG 2
Potexvirus	*Asparagus 3 virus*	RG 1
	Clover wound tumor virus	RG 1
	Clover yellow mosaic virus	RG 1
	Dioscorea latent virus	RG 1
	Lily X virus	RG 1
	Onion mite-borne latent virus	RG 1
	Rhododendron necrotic ringspot virus	RG 1
	Shallot mite-borne latent virus	RG 1
	Tulip X virus	RG 1
Sobemovirus	*Bean southern mosaic virus*	RG 1
	Blueberry shoestring virus	RG 1
	Olive latent 1 virus	RG 1
	Panicum mosaic virus	RG 1
	Sowbane mosaic virus	RG 1
Tenuivirus	*Maize stripe virus*	RG 1

Tobamovirus	*Cucumber green mottle mosaic virus* *Odontoglossum ringspot virus* *Paprika mild mottle virus* *Ribgrass mosaic virus*	RG 1 RG 1 RG 1 RG 1
Tobravirus	*Pea early browning virus*	RG 1
Trichovirus	*Cherry mottle leaf virus* *Potato T virus*	RG 1 RG 2
Tymovirus	*Abelia latent virus* *Eggplant mosaic virus* *Potato Andean latent virus*	RG 1 RG 1 RG 2
Umbravirus	*Carrot mottle mimic virus* *Sunflower crinkle virus*	RG 1 RG 1
Varicosavirus	*Camellia yellow mottle virus*	RG 1
Vitivirus	None	--
Unassigned genus	*Cucumber green mottle mosaic virus* *Maize white line mosaic virus* *Tulip halo necrosis virus* *Wineberry latent virus*	RG 1 RG 1 RG 1 RG 1

Appendix 4: Plant viroid species defined as Risk group (RG) 1 or 2 pests by MAF which are required for importation into containment as reference material during diagnostic testing.

1. *Pospiviroidae*		
Apscaviroid	*Apple scar skin viroid* *Citrus viroid III*	RG 1 RG 1
Cocadviroid	*Citrus viroid IV*	RG 1
Coleviroid	None	--
Hostuviroid	None	--
Pospiviroid	None	--
2. *Avsunviroidae*		
Avsunviroid	None	--
Pelamoviroid	*Chrysanthemum chlorotic mottle viroid* *Peach latent mosaic viroid*	RG 1 RG 1
3. *Unassigned family*		
Unassigned genus	None	**--**

Appendix 5: Plant virus species defined as A1 or A2 quarantine pests by EPPO which are required for importation into containment as reference material during diagnostic testing.

1. *Bromoviridae*		
Alfamovirus	None	--
Bromovirus	None	--
Cucumovirus	None	--
Ilarvirus	*Apple mosaic virus*	A 2
Oleavirus	None	--
2. *Bunyaviridae*		
Tospovirus	*Impatiens necrotic spot virus* *Tomato spotted wilt virus* *Watermelon silver mottle virus*	A 2 A 2 A 1
3. *Caulimoviridae*		
Badnavirus	*Citrus mosaic virus*	A 1
Caulimovirus	*Strawberry vein banding virus*	A 2
"CsVMV-like"	None	--
"PVCV-like"	None	--
"RTBV-like"	None	--
"SbCMV-like"	None	--
4. *Closteroviridae*		
Crinivirus	*Lettuce infectious yellows virus*	A 1
Closterovirus	*Citrus tristeza virus*	A 2
5. *Comoviridae*		
Comovirus	*Potato Andean mottle virus*	A 1
Fabavirus	None	--
Nepovirus	*Blueberry leaf mottle virus* *Cherry rasp leaf virus* *Cherry leaf roll virus* *Peach rosette mosaic virus* *Potato black ringspot virus* *Raspberry ringspot virus* *Satsuma dwarf virus* *Tobacco ringspot virus* *Tomato ringspot virus*	A 2 A 1 A 2 A 1 A 1 A 2 A 2 A 2 A 2
6. *Geminiviridae*		
Begomovirus	*Bean golden mosaic virus* *Squash leaf curl virus* *Tobacco mottle virus* *Tomato yellow leaf curl virus*	A 1 A 1 A 1 A 2
Curtovirus	None	--
Mastrevirus	None	--

7. *Luteoviridae*		
Enamovirus	None	--
Luteovirus	None	--
Polerovirus	None	--
8**. *Partitiviridae***		
Alphacryptovirus	None	--
Betacryptovirus	None	--
9. *Potyviridae*		
Bymovirus	None	--
Ipomovirus	None	--
Macluravirus	None	--
Potyvirus	*Plum pox virus*	A 2
Rymovirus	None	--
Tritimovirus	None	--
10. *Reoviridae*		
Fijivirus	None	--
Oryzavirus	None	--
Phytoreovirus	None	--
11. *Rhabdoviridae*		
Cytorhabdovirus	*Beet leaf curl virus* *Citrus leprosis virus*	A 2 A 1
Nucleorhabdovirus	*Potato yellow dwarf virus*	A 1
12. *Sequiviridae*		
Sequivirus	None	--
Waikavirus	None	--
13. *Tombusviridae*		
Aureusvirus	None	--
Avenavirus	None	--
Carmovirus	None	--
Dianthovirus	None	--
Machlomovirus	None	--
Necrovirus	None	--
Panicovirus	None	--
Tombusvirus	None	--

14. *Unassigned family*		
Allexivirus	None	--
Benyvirus	*Beet necrotic yellow vein virus*	A 2
Capillovirus	Citrus tatter leaf virus (syn. *Apple stem grooving virus*)	A 1
Carlavirus	None	--
Foveavirus	None	--
Furovirus	None	--
Hordeivirus	None	--
Idaeovirus	None	--
Marafivirus	None	--
Nanovirus	None	--
Ophiovirus	None	--
Ourmiavirus	None	--
Pecluvirus	None	--
Pomovirus	None	--
Potexvirus	None	--
Sobemovirus	None	--
Tenuivirus	None	--
Tobamovirus	None	--
Tobravirus	None	--
Trichovirus	*Potato T virus*	A 1
Tymovirus	*Potato Andean latent virus*	A 1
Umbravirus	None	--
Varicosavirus	None	--
Vitivirus	None	--
Unassigned genus	*Black rasberry latent virus* *Citrus blight disease* *Peach American mosaic virus* *Plum American line pattern virus* *Potato yellow vein virus* *Potato yellowing virus* *Raspberry leaf curl virus* *Strawberry latent C virus*	A 2 A 1 A 1 A 1 A 1 A 1 A 1 A 1

Data from EPPO (1997) and EPPO (2001).

Appendix 6: Plant viroid species defined as A1 or A2 quarantine pests by EPPO which are required for importation into containment as reference material during diagnostic testing.

1. *Pospiviroidae*		
Apscaviroid	None	--
Cocadviroid	*Coconut cadang cadang viroid*	A 1
Coleviroid	None	--
Hostuviroid	None	--
Pospiviroid	*Chrysanthemum stunt viroid* *Potato spindle tuber viroid*	A 2 A 2
2. *Avsunviroidae*		
Avsunviroid	None	--
Pelamoviroid	None	--
3. *Unassigned family*		
Unassigned genus	None	**--**

Data from EPPO (1997) and EPPO (2001).

Appendix 7: Plant permits issued by MAF for the importation of reference material ("positive controls") of plant viruses and viroids not present in New Zealand in an inactive state into containment – 1 January-29 July 1998

Date	Permit number	Organisation	Organism
3 July 1998	35660	MAF-NPPRL	*Potato spindle tuber viroid*
19 May 1998	35598	HortResearch	*Tobacco mosaic virus* – 25 transgenic isolates
24 April 1998	35568	MAF-NPPRL	*Blueberry shoestring virus*
26 March 1998	35518	MAF-NPPRL	*Avocado sunblotch viroid*
23 March 1998	35511	MAF-NPPRL	*Maize chlorotic mottle virus*
27 February1998	35490	Montana Wines Ltd.	*Grapevine fanleaf virus* *Grapevine leafroll associated virus I* *Grapevine leafroll associated virus III*
16 July 1997 – 15 July 1998	G97/BIO/312	MAF-NPPRL	All positive controls from Bioreba AG, Switzerland; 39 viruses
7 May1997 – 6 May 1998	G97/BIO/202	MAF-NPPRL	All positive controls from Agdia Inc., USA; 107 viruses and 2 viroids

Appendix 8: References

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Appendix 9: Certificates of approval of containment facility

Ministry of Agriculture and Forestry
National Plant Pest Reference Laboratory
Lynfield, Auckland

MANUAL for
PC1 CONTAINMENT of
MICROORGANISMS and GMOs

Version 27 July 2001

Ministry of Agriculture and Forestry
National Plant Pest Reference Laboratory
Lincoln, Canterbury

MANUAL for
PC2 CONTAINMENT of
MICROORGANISMS

Version 1.4 October 2001