Australian Potato Industry

Australian National Potato Cyst Nematode Management Plan

Final Plan

June 2012
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PCN Plan Executive Summary

The Australian National Potato Cyst Nematode Plan (PCN Plan or the Plan) is an initiative by the Australian potato industry to control and ultimately eradicate any PCN infestation and protect the industry from potentially great economic losses that will occur if the pathogen is not under official control.

The Plan is a document that will be submitted to responsible state and federal authorities via the Plant Health Committee after industry endorsement. The Plan is a basis for the harmonised management of PCN. While it addresses the main issues for PCN management, it also refers to some matters that still need addressing, and describes a way of approaching outstanding tasks.

The Plan should lead to a national industry code of practice and agreed regulatory approach including nomination of a custodian organisation or group to maintain the Plan. A small, efficient task force with an independent, national approach, agreed to by the Plant Health Committee and Industry should oversee the transition of the Plan to a national directive and industry code of practice. A uniform regulatory framework for Australia as set out in the Plan will be the only way to preserve and safeguard the current advantages most parts of the country have, of being recognised as PCN free.

The industry will use the Plan to understand requirements and implement best management practices to control the risk of PCN entry and spread.

By endorsing a national regulatory framework for PCN control, industry and regulators acknowledge that PCN does not recognise state borders and will possibly spread exponentially rather than decline, if not under official control, and supported by responsible industry practices.

This Plan is based on the Draft PCN Plan\(^1\) put together by Dr David Beardsell and the outcomes of intensive industry consultation through AUSVEG for Horticulture Australia Limited.

There are many terms and definition used in the Plan, which may be open to differences in interpretation. The Plan therefore commences with a comprehensive list of definitions of terms; acronyms used throughout the Plan are also explained.

Managing Risks

Biosecurity agencies have stated that a ‘no risk situation’ does not exist; this includes PCN. Therefore, the Plan sets out how to control the risks of spreading PCN, and apply a risk based approach to PCN surveillance. There are two risk categories.

1. Land Risk Status

   The first risk categorisation is based on the status and management of land and crops. This includes but may not be limited to:
   - PCN infestation status,

• linkage to infested and potentially infested land,
• use of varieties, seed certification status,
• potato and host crop rotation intensity (including control of volunteers potatoes / groundkeepers), and
• adherence to hygiene codes of practice, livestock management and PCN control measures.

Details on the Land Risk Status categories are explained and summarised in a table in the Plan.

2. Risk Pathways

The second risk categorisation is based on known pathways of spread of PCN. These are called ‘Risk Pathways’ in the Plan. The movement and use of any type of seed tubers with unknown PCN status, whether from seed or commercial crops, poses the highest risk of PCN spread. The Plan therefore calls for an inclusion of PCN testing into all seed certification schemes as per the current Australian National Standard. The use of certified seed would be considered in determining the land risk status and thus surveillance requirements.

The next level of pathway risk relates to the movement of soil adhering to plant parts, objects, animals and people. Movement of plant parts and objects from infested and linked land and market access conditions will remain under official control to protect the industry. The risk pathways are tabulated in the Plan.

Most risks not related to established PCN infestations of land can be managed by the industry through a generally accepted Code of Practice. Therefore a PCN Farm Hygiene Code of Practice (Code) is included in this Plan. The Code is a very important part of the Plan and forms the basis of responsible risk management in the potato industry to prevent the entry and spread of PCN in Australia. The Code is designed as a voluntary system.

To determine the risks of PCN infestation and spread for a potato business (Land Risk Status, Risk Pathways) and for the purpose of general surveillance, regulators will predominantly rely on general farm and QA records demonstrating the implementation of the Code. If the code was not followed and appropriate records kept this will have implications on the Land Risk Status classification and thus surveillance requirements. The Code will benefit the industry by controlling the spread and severity of many other soil borne diseases.

Risk-based Surveillance

The Plan sets out how to determine the PCN status of land using a risk based surveillance approach. The approach has been based on previous work conducted in Australia, international standards for phytosanitary measures (in regards to surveillance), and relevant literature. Guidance was also taken from regulations implemented in countries with a history of PCN management. The Plan distinguishes between surveillance for detection, monitoring and delimiting land via soil testing and general surveillance, which requires appropriate

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record keeping about land and farm management practices. The conditions and a process for general surveillance, pertaining to low and very low risk land are explained in the Plan.

The Plan includes a draft field soil sampling procedure and also provides guidance on developing procedures for collecting soil from harvesters or grading lines under certain conditions. Testing procedures are described briefly; detailing accepted testing and laboratory accreditation procedures would have to be made part of an implementation plan.

The surveillance program requires that potato businesses be registered with responsible authorities and certification depending on the type of operation (growing, packing, processing), associated land risk status and pathway risks. Businesses and regulators will have to keep adequate records in regards to their risk management activities, surveillance results etc. The Plan explains that for growers this will be part of their quality assurance and farm biosecurity procedures and records. Regulators will use existing data capture systems or create appropriate confidential databases. The Plan sets out how the PCN reporting processes can work.

A system of random auditing of businesses QA records pertaining to the ’land risk status’, ’risk pathways’ and adherence to the PCN Farm Hygiene Code of Practice needs to be established. This has to fit in with existing QA and audit systems to be cost and time efficient.

Protocols

Based on the risk based surveillance approach, the Plan includes a set of detailed protocols that deal with issues that fall under the first risk category, i.e. the status and management of land and crops. They set out how to:

- Discover, define, register, manage and delimit infested and linked land;
- Manage new PCN detections for all PCN strains (incl. response, reporting);
- Manage non-linked land;
- Establish and maintain ‘PCN Free Status’ (‘Area Freedom’ from PCN) for different land areas (states, regions, properties, production units) and phytosanitary requirements for safeguarding PCN freedom;
- Prove absence of PCN following an earlier detection (eradication); and
- Change the registered land risk status category and or PCN status of land (i.e. infested to linked, linked to PCN free);

Another set of protocols brings in the second risk category, i.e. the movement and market access conditions for seed, ware and processing tubers, equipment, containers and machinery, waste and other materials from infested land (very high risk land) and land of the other land risk status categories. This includes conditions under which movement of PCN host material from high-risk land with indeterminate status is allowed. Movement conditions are summarised in an easy to follow table in the Plan.

Another protocol deals with the PCN certification of potato seed. General conditions for handling and certifying PCN host material are also dealt with in a protocol.

Some protocols for accreditation are included:
- Soil removal standards;
- Conditions for packing / processing;
- Labelling standards; and
- Conditions for movement off farm;

Protocols to manage traceability and keep appropriate records as well as conduct reporting are in the Plan. It provides conditions for certification to local and interstate markets from, infested, linked and non-linked land.

Protocols may be amended and further protocols or procedures developed by responsible authorities before or during the implementation process; some suggestions are made in the Plan.

For the benefit of the industry and regulators the Plan also includes a comprehensive list of potato cultivars highly resistant to the Ro1 pathotype of *Globodera rostochiensis*
Foreword to the PCN Plan

Potato cyst nematodes (PCN) *Globodera pallida* (pale potato cyst nematode) and *Globodera rostochiensis* (golden potato cyst nematode) are recognised as harmful organisms for potato crops. They can cause significant yield reduction and economic loss to all supply chain partners in the Australian potato industry.

The Australian industry and state / federal governments opted for a risk-based approach to potato cyst nematode (PCN) management and mitigation in 2005, recognising that prevention and control are the best option for avoiding the economic impact PCN would have on the Australian potato industry, if the pathogen's management and potential incursions of new and exotic pathotypes or strains were not under official control.

It is important for the future of the industry to maintain Australia's status of being principally free of PCN, and provide certainty that the very limited areas where the pathogen *Globodera rostochiensis* only is present are subject to official control with the goal of eradication.

This Australian National Potato Cyst Nematode Management Plan (the PCN Plan) provides the basis for national, harmonised protocols for the control, management and mitigation of spread of PCN in Australia.

The Plan allows determining the PCN free status of defined land areas based on official, risk based surveillance programs and movement conditions focussing on host plants, materials and objects. It allows for the effective management of potential risks at the source rather than implementing costly control measures and regulation after spread and detection, which would cause severe economic loss to affected businesses and government.
Endorsement, Implementation and Governance

1.1 Endorsement

The federal and State plant health authorities endorse the Australian National Potato Cyst Nematode Management Plan (the PCN Plan or the Plan) as a framework and starting point for a nationally harmonised protocol to control PCN in Australia, once industry approval coordinated by AUSVEG, and including other relevant potato peak industry bodies, has been obtained.

1.2 Implementation

The first step towards implementation of a national protocol is for industry and regulators to accept this Plan. This means each jurisdiction is prepared to adopt the Plan’s recommendations for minimum standards of PCN control and management requirements, and agrees for work to be carried out on some issues currently not fully finalised in this Plan in a constructive manner. The Plan allows for state and regional differences in pest risk status and additional requirements by state authorities, amendments and updates.

The following steps are recommended for the realisation of the Plan.

1. The Plant Health Committee and Industry jointly authorise an efficient PCN Plan implementation task force (the task force) made up of regulators and industry representatives to drive the implementation process. This group would best be limited to seven (7) persons that can take a primary position on the issue and have the integrity to assume the required national approach with an emphasis on the future success of the Australian industry.

2. The Plant Health Committee and Industry authorise the task force to finalise outstanding issues in this Plan, and / or amend the Plan as required. This may include but not be limited to data collection, management and reporting, and a review or addition of protocols. The task force may also determine further information needs and provide advice to the Plant Health Committee and Industry how this information may be gathered and used efficiently.

3. The Plant Health Committee and Industry agree on a stepwise implementation of the Plan and advise the task force to work accordingly. For the protection of the industry the focus must be on the greatest pathway and land status risks as a matter of priority. This would be seed health control and the regulation of infested and linked land. Examples of priority issues to be addressed are:

   o Not certified ‘on-off seed’ planted as a generation 2, 3, 4 or 5 as it is significant in the national seed trade and thus currently poses a significant risk of PCN spread.

   o Review of PCN surveillance requirements and subsequent management of the Australian National Standard for Potato Seed Certification.

   o Management of practice change

In parallel, any parts of the Plan that are straightforward such as e.g. a PCN Hygiene Code of Practice (Appendix 1), should be agreed upon and implemented ASAP.
Once priority issues have been dealt with, the next steps would be to work on the implementation of further sections of the plan based on risk hierarchies, i.e. dealing with greater risk issues that have a higher likelihood of occurring, and or would have the most severe economic consequences for the entire industry first. Guidance is provided in the risk pathway and land use risk tables in this Plan.

The task force would also identify and categorise gaps in the Plan, some of which have been pointed out in this current revision of the original Draft Plan by D. Beardsell; while others are likely to arise while working through details of the implementation process. Gaps may relate to protocols, procedures or issues that require further data review or R&D. Addressing gaps should also be prioritised based on risks to Australia’s PCN status and control. Identifying and addressing gaps must not hinder the implementation of priority issues (control of seed and infestations) or applying parts of the Plan that can be agreed on and instigated easily and quickly.

The task force would provide clear guidance on issues including but not limited to:

- What growers will need to do in the short and medium term?
- What packers will need to do in the short and medium term?
- What processors will need to do in the short and medium term?
- What federal and state authorities will need to do in the short and medium term?
- Certification requirements for sampling and analytical services / activities
- Funding of the set up and running of surveillance programs incl. databases, and
  - after a new detection, who pays for intensive surveillance and assistance to affected (and linked) landholders and what forms of assistance can be made available?

Details regarding individual states’ rights or freedom to trade will also have to be addressed by the task force.

Industry, through AUSVEG and other regional industry bodies, will assist adoption of a PCN Hygiene Code of Practice (Appendix 1) on Australian potato farms.

Both, industry and regulators would have to make some changes to current practices and procedures to implement the Plan and control the spread of PCN nationally. The cost and effort of doing this will be small in comparison to the costs and effort required once PCN was out of control in Australia and affected productivity, processing costs and market access.

PCN Outbreak would currently lead to an enforcement of tighter regulatory control under individual state regulations, including extensive surveillance requirements paid for by industry and trade restrictions, than would be required under an agreed national Plan.

A communication plan will need to be implemented to support the release of the national directive and industry code of practice that will follow the Plan.

**Commencement and duration of the Plan**

The Plan will be implemented and applied immediately after the date of signature by authorised representatives of federal and state plant health authorities and will remain in effect unless terminated by consent as of a date approved in writing by federal and state
plant health authorities and as confirmed by the signatures of their authorised representatives.

1.3 Governance

Once the task force has completed its work, a National PCN Management Committee of five to seven (5-7) persons should be called to oversee regular reviews of the Plan (underpinning the national directive and industry code of practice). These reviews may occur every four (4) years or as required if urgent issues need addressing. It would include federal and state government delegates as well as representatives from appropriate national peak industry bodies. Agencies may decide to rotate representation. The task force may decide on a custodian organisation or group that coordinates the National PCN Management Committee.

The Plan may be also reviewed and updated if requested by the majority of members of federal and state plant health authorities that have endorsed the original Plan. Responsibility for maintaining and updating the Plan would reside with Plant Health Australia.

1.3.1 Non-compliance and dispute resolution

In the event of non-compliance with a requirement specified in the endorsed Plan or regarding the interpretation or implementation, the federal and state plant health authorities agree to discuss the matter for prompt resolution. If discussions between the federal and state plant health authorities are not able to resolve the dispute the Plant Health Committee will jointly select a facilitator for continued discussions. The Plan may be reviewed and updated as a result of dispute resolution.
## Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation or Acronym</th>
<th>Standing for:</th>
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<tbody>
<tr>
<td>ALPP</td>
<td>Area of Low Pest Prevalence</td>
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<tr>
<td>AQIS</td>
<td>Australian Quarantine Inspection Service</td>
</tr>
<tr>
<td>AUSVEG</td>
<td>Australian Vegetable and Potato Peak Industry Body</td>
</tr>
<tr>
<td>BA</td>
<td>Biosecurity Australia</td>
</tr>
<tr>
<td>CCEPP</td>
<td>Consultative Committee on Emergency Plant Pests</td>
</tr>
<tr>
<td>CHPM</td>
<td>Chief Plant Health Manager (in each state)</td>
</tr>
<tr>
<td>CPPO</td>
<td>Chief Plant Protection Officer</td>
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<tr>
<td>DAFF</td>
<td>Department of Agriculture Forestry and Fisheries</td>
</tr>
<tr>
<td>DQMAWG</td>
<td>Domestic Quarantine and Market Access Working Group</td>
</tr>
<tr>
<td>EPP</td>
<td>Emergency Plant Pest</td>
</tr>
<tr>
<td>HAL</td>
<td>Horticulture Australia Limited</td>
</tr>
<tr>
<td>ISPM</td>
<td>International Standard for Phytosanitary Measures</td>
</tr>
<tr>
<td>IPPC</td>
<td>International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended [FAO, 1990; revised ICPM, 2001]</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Audit Critical Control Point - risk management system</td>
</tr>
<tr>
<td>NMG</td>
<td>National Management Group (State and Federal Agriculture CEOs)</td>
</tr>
<tr>
<td>NPPO</td>
<td>National Plant Protection Organisation</td>
</tr>
<tr>
<td>OCPPO</td>
<td>Office of the Chief Plant Protection Officer</td>
</tr>
<tr>
<td>PCN</td>
<td>Potato Cyst Nematode</td>
</tr>
<tr>
<td>PCN Plan</td>
<td>Australian National Potato Cyst Nematode Management Plan or National PCN Management Plan (this document)</td>
</tr>
<tr>
<td>PFA</td>
<td>Pest Free Area</td>
</tr>
<tr>
<td>PHA</td>
<td>Plant Health Australia</td>
</tr>
<tr>
<td>PHC</td>
<td>Plant Health Committee (Australia)</td>
</tr>
<tr>
<td>PHAC</td>
<td>Plant Health Assurance Certificate</td>
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<tr>
<td>SAP</td>
<td>Scientific Advisory Panel</td>
</tr>
<tr>
<td>VICSPA</td>
<td>Victorian Certified Seed Potato Authority</td>
</tr>
</tbody>
</table>
2 Introduction

A National PCN Plan provides all jurisdictions with a harmonised regulatory framework for the control, management and mitigation of spread of PCN based on pest risk. It enables each state to have PCN regulatory controls consistent with the Plan, with allowance for regional differences in risk and statewide or regional area freedom. The Plan will ensure that PCN remains a pest of quarantine concern under official control with the long-term aim of eradication. This management Plan has been developed to allow for:

- Effective, risk based surveillance based on international standards and aimed at early detection, and include guidance for sampling, testing, reporting and record keeping.
- Direction for the development of a response plan to control and manage new PCN outbreaks including for exotic strains of golden / yellow PCN (*Globodera rostochiensis* (Wollenweber) Behrens) as well as pale / white PCN (*Globodera pallida* (Stone) Behrens); which are not known to occur in Australia.
- Minimising the influence of control measures on production and market access, and thus economic and social impacts, through effective, appropriate control and risk mitigation strategies for PCN infested and linked land to stop PCN spread via soil adhering to tubers, host plants, machinery or equipment and reduce levels in infested land with the ultimate aim of eradication, which will allow individual growers to continue production.
- Validation of the area free status from PCN for defined land areas based on surveillance.

The EU Directive on the Control of PCN (European Council Directive 2007/33/EC) states that the highest risk of PCN spread comes from infested seed. Therefore the Plan specifies to disallow the movement of potato tubers for the purpose of planting for potato crop production from infested and linked land. Following advice from international PCN experts, the Plan calls for a national requirement for PCN certified seed, and strongly recommends the use of certified seed only for commercial crop production with the aim of eliminating the use of potato seed which lacks traceability and has no record of PCN testing.

The Plan stipulates that infested and linked land should only be planted with PCN resistant cultivars. It recommends for industry to be proactive in selecting suitable varieties and foster industry wide adoption of these. To further control the spread of the pathogen, the Plan asks for and describes identity tracing in the market chain for high-risk potatoes from linked and infested land.

The Plan provides:

- Information on surveillance protocols
- A comprehensive PCN Hygiene Code of Practice for on-farm biosecurity and PCN management in supply chains to minimise the risk of PCN entering and leaving farms; a measure which will also control the spread of other soil borne pests and diseases.
- Standards for the removal of soil from ware and processing tubers by grading, brushing or washing and protocols for cleaning and certifying used equipment and bins.
- Protocols for safe management of waste disposal on farm, in pack houses and in processing facilities.
- A list of potato cultivars with documented resistance to the Ro1 strain of PCN.

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3 Definitions of Terms

Scope

This section provides definition for terms used throughout the PCN Plan.

Purpose

The purpose of providing definitions is to provide a clear understanding of terms used and avoid misinterpretation of meaning.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Absence of Pest</strong></td>
<td>Absence of PCN in a defined region / area verified by surveillance. Refer to ISPM 8: ‘Determination of Pest Status in an Area’ for the specific definitions on determining pest absence. Also refer to ‘Pest Free Area’ definition.</td>
</tr>
<tr>
<td><strong>Certified Laboratory</strong></td>
<td>Laboratory approved by a responsible federal, state or territory authority to undertake PCN testing.</td>
</tr>
<tr>
<td><strong>Accepted surveillance (protocols)</strong></td>
<td>PCN surveillance protocols and procedures listed in this PCN Plan and / or approved by the Plant Health Committee and / or a state or territory quarantine authority.</td>
</tr>
<tr>
<td><strong>Accepted testing procedures</strong></td>
<td>PCN testing procedures approved by a state or territory quarantine authority.</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>An officially defined region with clear boundaries, a country, part of a country (e.g. state or other type of jurisdiction or land area). An area may contain clearly defined subunits, which are districts, or zones and these may contain properties or premises as further subunits, which may contain production units with clearly defined boundaries. The term ‘region’ may be used instead of ‘area’.</td>
</tr>
<tr>
<td><strong>Area Freedom from PCN (Pest Free Area PFA)</strong></td>
<td>Freedom from PCN for an area or subunit to an area; Pest Free Area as per ISPM 29 (2007) officially confirmed through an Area Freedom Certificate which is granted as a result of accepted surveillance. Area freedom may be granted for land with a history of potato and host crop production based on accepted surveillance data. N.B. Exporting, trading or contracting parties may establish PFAs, in order to gain, maintain or improve market access. Area freedom does not completely remove the need for surveillance. Surveillance requirements may be stated in the Area Freedom Certificate or a separate documentation in connection to the Area Freedom Certificate. Area freedom will require maintenance surveillance as per this Plan.</td>
</tr>
<tr>
<td><strong>Area Freedom Certificate (for PCN)</strong></td>
<td>A certificate issued by a state or territory quarantine authority certifying that an area is a nationally recognised PCN pest free area verified by accepted surveillance protocols and testing procedures (refer to protocols and procedures in the endorsed PCN Plan and state specific requirements). Area freedom will require maintenance surveillance as per this Plan.</td>
</tr>
<tr>
<td><strong>Area of Low Prevalence of a Pest (ALPP)</strong></td>
<td>An ALPP is an area, whether all of a country, part of a country, or all or parts of several countries, identified by the responsible authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures. N.B.: Areas of low pest prevalence may be established as per ISPM 22 (2005) and ISPM 29 (2007). Exporting contracting parties may establish ALPPs, among other reasons, in order to gain, maintain or improve market access.</td>
</tr>
<tr>
<td><strong>Australian National Standard for Potato Seed Certification</strong></td>
<td>Standard seed production protocols approved by state or territory quarantine authorities</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Authorised Person</strong></td>
<td>An employee of a potato production and or packing enterprise or responsible authority who is approved by the state or territory quarantine authority to undertake soil sampling, handling, and sending to a certified laboratory for PCN testing soil testing, record keeping, reporting of testing results or access to testing data. N.B. the same person may not necessarily be authorised for all activities.</td>
</tr>
<tr>
<td><strong>Buffer Zone</strong></td>
<td>An area in which a specific pest does not occur or occurs at a low level and is officially controlled, that either encloses or is adjacent to an infested area, an infested place of production, an area of low pest prevalence, a pest free area, a pest free place of production or a pest free production site, and in which phytosanitary measures are taken to prevent spread of the pest [ISPM No. 10, 1999; revised ISPM No. 22, 2005]</td>
</tr>
<tr>
<td><strong>Certified Seed Potatoes</strong></td>
<td>Potato seed produced under a high health scheme that meets national certification standards for the production of seed potatoes</td>
</tr>
<tr>
<td><strong>Certified Seed Potatoes (for PCN)</strong></td>
<td>Potato seed verified to be from PCN free land based on surveillance of that land i.e. official area, property or paddock freedom status</td>
</tr>
<tr>
<td><strong>Certification Standards for the Production of Seed Potatoes</strong></td>
<td>= Australian National Standard for Potato Seed Certification: Standard production protocols approved by state or territory quarantine authorities</td>
</tr>
<tr>
<td><strong>Commercial Potato Growers</strong></td>
<td>Growers producing potatoes for the fresh and/or processing market. They may also grow potato seed and therefore be seed growers at the same time.</td>
</tr>
<tr>
<td><strong>Containment</strong></td>
<td>Application of phytosanitary measures in and around an infested area / region to prevent the spread of PCN.</td>
</tr>
<tr>
<td><strong>Control (of a pest)</strong></td>
<td>Suppression, containment or eradication of a pest population [FAO, 1995]</td>
</tr>
<tr>
<td><strong>Control Zone (Area, District or Region)</strong></td>
<td>A quarantine area / region where legislated risk mitigation controls are enforced to stop the spread of PCN.</td>
</tr>
<tr>
<td><strong>Defined area</strong></td>
<td>A production area that is defined by map reference and has clearly identifiable boundaries.</td>
</tr>
<tr>
<td><strong>Detection Survey</strong></td>
<td>Survey using recognised surveillance protocols conducted in an area to determine if PCN is present.</td>
</tr>
<tr>
<td><strong>Delimiting Survey</strong></td>
<td>Survey conducted to establish the boundaries of an area considered to be infested by or free from a pest [FAO, 1990]</td>
</tr>
<tr>
<td><strong>District Freedom from PCN</strong></td>
<td>Freedom from PCN for a district or zone, officially confirmed through an Area Freedom Certificate. Regulations apply as for area freedom.</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td>Means any equipment that has been used in the cultivation, harvesting, handling, packing, processing or transportation of potatoes.</td>
</tr>
<tr>
<td><strong>Eradication</strong></td>
<td>Application of phytosanitary measures to eliminate a pest from an area. FAO, 1990] The permanent elimination of the introduced pest or pathogen from the ecosystem, which means that it can no longer be detected by recognised surveillance protocols and approved testing procedures.</td>
</tr>
<tr>
<td><strong>Free from PCN (a consignment or production unit)</strong></td>
<td>Without PCN in quantities that can be detected by the application of recognised surveillance protocols and approved testing procedures.</td>
</tr>
<tr>
<td><strong>General Surveillance for PCN</strong></td>
<td>A process whereby information on PCN, which is of concern for an area, is gathered from many sources, wherever it is available, and provided for use by the NPPO.</td>
</tr>
<tr>
<td><strong>Ground Keepers</strong></td>
<td>Self sown potatoes, volunteer potatoes</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Indeterminate PCN status                  | The status of land which is  
- Is not linked to PCN infested land, has no history of PCN infestation for said land or any land linked to it, and has not been investigated through recognised PCN surveillance protocols and approved testing procedures, or  
- has temporarily lost PCN free status because of a PCN detection in the production area, region, district or zone. |
| Individual Consignment Soil Sample         | A sample of soil contained in one receptacle, which has been collected from one production unit belonging to an individual grower. An individual consignment soil sample for PCN testing consists of subsamples taken from one production unit according to sampling procedures in recognised surveillance protocols. |
| Infested Land                              | An area (region, district, zone, property, premises or production unit) defined by GPS coordinates or other clearly identifiable boundaries within which PCN infestation has been detected (positive PCN test) using recognised sampling protocols and approved testing procedures and for which infestation has been confirmed by a quarantine authority keeping record of the positive PCN test. |
| Infested Property or Premises              | A continuous land unit which is managed as an entity, defined by GPS coordinates or other clearly identifiable boundaries, within which PCN infestation has been detected (positive PCN test) using recognised surveillance protocols and approved testing procedures and for which infestation has been verified by a quarantine authority keeping record of the positive PCN test (analogous to “Infected Premises” as defined in PHA PLANTPLAN). |
| Infested Production Unit                   | A production unit defined by GPS coordinates or other clearly identifiable boundaries within which PCN infestation has been detected (positive PCN test) using recognised surveillance protocols and approved testing procedures, and for which infestation has been confirmed by a quarantine authority keeping record of the positive PCN test (a subset of “Infected Premises” as defined in PHA PLANTPLAN). |
| Investigation                              | A methodical procedure involving the use of recognised sampling protocols and approved testing procedures to determine the presence of PCN in a production unit. |
| Golden Potato Cyst Nematode, PCN          | Means the pest *Globodera rostochiensis* Wollenweber; in this document, the term potato cyst nematode or PCN is used for the golden PCN. |
| High Risk Land                            | - Linked land  
- Indeterminate land that has temporarily lost PCN free status because of PCN detection in the production area, region, district or zone. |
| Headlands                                 | Margins of a production unit (paddock, field, pivot) used for loading / unloading trucks and trailers; parts of paddocks at and around customary production unit access points where equipment and bins first come into contact with field soil and which has the highest risk of PCN infestation. |
| Host Plant and Material                   | Plants and materials that host PCN; hosts allow PCN to multiply, host material such as soil allows PCN to survive without multiplication. |
| Land in a land in a production unit       | Land in a production unit for the purpose of soil sampling and surveillance refers to the area of land in a production unit that has been, is or will be planted with potatoes. Areas in a production unit that are not planted with potatoes. |
| Land risk status (land risk categories)   | The land risk status describes the risk of land being infested by PCN in five (5) categories Very High (5), High (4), Medium (3), Low (2) and Very Low (1). The categorisation is mainly based on the known status of infestation, linkage to infested land, potato rotation intensity, seed health status, cultivars grown and PCN monitoring status of land. |
### Linked Land

Means any land which:
- is operated by an individual who has farmed or does farm on infested land, or
- has been farmed with equipment which has been used on infested land, or
- directly borders infested land, or
- directly receives drainage water or run-off containing soil particles from infested land onto a production area or headlands (i.e. drainage / run-off water is not completely diverted away from any productive area or headlands), or
- has had a crop planted using seed potatoes or other host plant material that originated from an infested property or production unit, verified as infested:
  1. before or while the seed potatoes or host plant material were removed from it, or
  2. within 12 months after removal of the seed potatoes or host plant material from it.

### Linked Property

A property is linked if it shares or brings in any of the following with / from an infested property:
- management / people
- equipment
- vehicles,
- materials that have been in contact with soil on a PCN infested property
- soil,
- produce with soil adhering to it or
- water.

Analogous to “Contact Premises” (CP) as defined in PHA PLANTPLAN.

### Low Risk Land

Non linked land of indeterminate status with a history of potato production (>2 crops in 10 years) and no history of PCN infestation for said land or any land linked to it, and the status not is confirmed via soil testing using recognised surveillance protocols and approved testing procedures.

### Monitoring Survey

Monitoring surveys apply where a pest is known to be present and the survey is planned to examine aspects of the pest population such as the prevalence of the pest and changes in prevalence over time.

### Natural Spread Area

An area to which PCN could spread by contaminated direct run-off water or soil erosion. This area has the same status as linked land.

### Non-Linked Land

A production unit or property verified to be free from PCN by appropriate testing using recognised surveillance protocols and approved testing procedures, which is located within a PCN Control Zone, area, region or district (to distinguish it from a Pest Free Area).

### Official or Officially

Established, authorised or performed by the responsible official bodies i.e. quarantien authorities.

### Official Control

The 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.

### Packaging

Means any article in which potatoes or other host plants have been contained, wrapped or packed and includes containers and bags.

### Paddock Freedom from PCN

A defined production unit (e.g. subunit of a farm, paddock) that has been tested using recognised surveillance protocols and approved testing procedures (refer this document: Determining PCN Status) and PCN has not been detected and a quarantine authority has officially verified this.
<p>| Pale or White Potato Cyst Nematode | Means the pest <em>Globodera pallida</em> (Stone) Behrens; reference to this pathogen in this document is made by using the name ‘pale potato cyst nematode or pale PCN.’ |
| Pathway Risks | Risks of spreading PCN rated depending on host materials involved and their movement between areas of different infestation or land risk status |
| PCN Standard National Soil Test | Means a test for potato cyst nematode (PCN) conducted in accordance with an accepted PCN testing procedure (e.g. Hinch 1991, EU PCN Directive) |
| Pest Free Area (PFA) | Area where a pest is not absent as per ISPM 29 (2007). |
| Pest Free Area, PFA | Pest free area (PFA) is a term that can be applied to an area of any size that is free of a pest. The term is used when negotiating and maintaining international market access. The ISPM definition is: “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” to prevent occurrence of quarantine pests or for the management of regulated non-quarantine pests. The PCN Plan applies three main types of pest free areas: 1. An entire country, jurisdiction, region, district or zone, 2. The uninfested part of a country, jurisdiction, region, district or zone in which a limited proportion of infested land is present. 3. An uninfested land area situated within a generally infested land area where the uninfested land constitutes non-linked land. |
| Pest (PCN) Free Place of Production | Place of production with clearly identifiable boundaries where PCN does not occur as demonstrated by scientific evidence and which is not linked land, and in which, where appropriate, this condition is being officially maintained. |
| Pest (PCN) Free Production Site or Unit | A defined portion of a place of production in which PCN 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 |
| Pest Record for PCN | A document providing information concerning the presence or absence of PCN at a particular location at a certain time, within an area under described circumstances. |
| Pest Status for PCN | Presence or absence, at the present time, of PCN in an area, including, where appropriate, its distribution, as officially determined using expert judgment on the basis of current and historical pest records and other information. |
| Piler Dirt | Dirt from piles that accumulate on shed floors during handling of harvested potato tubers, e.g. soil piling up during sorting under grading lines. |
| Plant Health Assurance Certificate (PHAC) | A PHAC is used to facilitate movement of a plant based consignment to another state, or within a state to other parts of that state. |
| Plant Health Committee (PHC) | The principal focus of the Committee is facilitation of improved biosecurity for Australia’s plant industries and contribution to safe domestic and international trade in plant products. It collaborates with Plant Health Australia and other appropriate organisations and committees. PHC membership comprises of representatives from the Australian Government Department of Agriculture, Fisheries and Forestry (Office of the Chief Plant Protection Officer and Biosecurity Australia), the state and territory departments of primary industries and agriculture, Plant Health Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Research Priority Coordination Committee, MAF (Ministry of Agriculture and Forestry), Biosecurity Authority (observer status), the Cooperative Research Centre for National Plant... |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive PCN Test</td>
<td>PCN test result(s) showing that PCN cysts or PCN DNA are present in a sample of soil using recognised surveillance protocols and approved testing procedures.</td>
</tr>
<tr>
<td>Potato Growing Area or Land</td>
<td>Area or subunit of an area where potato crops are grown</td>
</tr>
<tr>
<td>Potato Growing Land</td>
<td>Production Unit or Production Site</td>
</tr>
<tr>
<td>Potato Tuber</td>
<td>Means a tuber of the species <em>Solanum tuberosum</em></td>
</tr>
<tr>
<td>Potato Plant</td>
<td>Means a plant of the species <em>Solanum tuberosum</em></td>
</tr>
<tr>
<td>Potato Grading Line</td>
<td>Any equipment set up which is used to size and quality grade potato tubers</td>
</tr>
<tr>
<td>Potato Packing Line</td>
<td>Any equipment set up which is used to pack potato tubers</td>
</tr>
<tr>
<td>Potato Packing Shed</td>
<td>Any facility, which is used for the grading and/or packing of potato tubers</td>
</tr>
<tr>
<td>Practically Free of Soil</td>
<td>Refers to potato tubers or host plant materials that do not carry any detachable soil following brushing or washing.</td>
</tr>
<tr>
<td>Processing Potatoes</td>
<td>Potatoes grown for processing into e.g. crisp, French fries or other prepared potato products that do not constitute fresh potatoes.</td>
</tr>
<tr>
<td>Production Unit or Production Site</td>
<td>An area of land, defined via GPS coordinates or other clearly identifiable demarcations, used for the production of one and the same crop, clearly identifiable as such during the production period for that crop. This can be a paddock, field, pivot or part pivot area.</td>
</tr>
<tr>
<td>Production Area, Region, District or Zone</td>
<td>A distinct area, region, district or zone in which potatoes are produced and which can be clearly spatially separated from others by geographical attributes and/or a buffer zone which is free of potato production and which would allow separate regulation of that area, region, district or zone in the case of a PCN detection within that distinct area, region, district or zone.</td>
</tr>
<tr>
<td>Property or Premises or Place of Production</td>
<td>A continuous land unit which is managed as an entity, defined by GPS coordinates or other spatially clearly identifiable boundaries. Any premises or collection of fields operated as a single production or farming unit. This may include production sites which are separately managed for phytosanitary purposes [FAO, 1990; revised CEPM, 1999].</td>
</tr>
<tr>
<td>Property Freedom from PCN</td>
<td>A defined property, for which all production units that have been and are in a potato rotation have been PCN tested using recognised surveillance protocols and approved testing procedures (refer to protocols and procedures in this PCN Plan under 5 Determining PCN Status of Land) and PCN has not been detected, and this has been verified. Property and area freedom will require maintenance surveillance as per this Plan.</td>
</tr>
<tr>
<td>Resistant Cultivar (against PCN)</td>
<td>Potato Cultivar that inhibits the completion of the life cycle of golden PCN and/or pale PCN</td>
</tr>
<tr>
<td>Seed Potatoes (Potato Seed)</td>
<td>Any potato tubers that will be planted by commercial potato growers for the production of seed, ware or processing potato crops or potato tubers that will be planted by other commercial entities in the field. This includes potato tubers grown specifically for replanting as well as tubers taken out of ware or processing crops for replanting as seed.</td>
</tr>
<tr>
<td>Seed Potato Growers</td>
<td>Potato growers who grow potato seed specifically for replanting.</td>
</tr>
<tr>
<td>Self Sown Potatoes (Ground Keepers)</td>
<td>Potato plants that re-sprout from tubers remaining in soil after crops have been harvested. (is the UK term).</td>
</tr>
<tr>
<td>Scientific evidence (relating to PCN surveillance)</td>
<td>Evidence based on recognised surveillance protocols and approved testing procedures</td>
</tr>
</tbody>
</table>
| Soil                                           | The unconsolidated mineral or organic material on the immediate...
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>surface of the Earth that serves as a natural medium for the growth of land plants.</td>
<td></td>
</tr>
<tr>
<td><strong>Soil Adhesion Standard</strong></td>
<td>Means the agreed level of potato cleanliness required for potatoes grown within a PCN control zone.</td>
</tr>
<tr>
<td><strong>Specific PCN Surveys</strong></td>
<td>Procedures by which NPPOs obtain information on pests of concern on specific sites in an area over a defined period of time.</td>
</tr>
<tr>
<td><strong>State Biosecurity Authority or Authority</strong></td>
<td>A government authority legally responsible for administering a State or Territory biosecurity regulations.</td>
</tr>
<tr>
<td><strong>Suspected Infected Premises</strong></td>
<td>A premises containing plants or soil that may have been exposed to PCN and which is subject to quarantine regulation and intense surveillance.</td>
</tr>
<tr>
<td><strong>Surveillance for PCN</strong></td>
<td>An official process which collects and records data on PCN occurrence or absence by survey, monitoring or other procedures using recognised protocols and approved testing procedures.</td>
</tr>
<tr>
<td><strong>Survey for PCN</strong></td>
<td>A methodical official procedure conducted over a defined period of time to determine the distribution of PCN in an area.</td>
</tr>
<tr>
<td><strong>Uncertified Seed</strong></td>
<td>Seed potatoes that:</td>
</tr>
<tr>
<td></td>
<td>• were not grown under a certification scheme or</td>
</tr>
<tr>
<td></td>
<td>• do not meet certification requirements under a seed potato certification scheme that meets the national standard.</td>
</tr>
<tr>
<td><strong>Under Harvester or Grader PCN Testing</strong></td>
<td>PCN analysis of soil collected from below grading lines using a accepted standards, protocols and procedures and approved testing procedures listed in this Plan.</td>
</tr>
<tr>
<td><strong>Uninfested Land</strong></td>
<td>Means any production unit that is not linked land and has been verified as being free from PCN within 18 months or less prior to a current potato crop being harvested.</td>
</tr>
<tr>
<td><strong>Untested Land</strong></td>
<td>Means any production unit that has never been tested for PCN using recognised surveillance protocols and approved testing procedures.</td>
</tr>
<tr>
<td><strong>Verified Positive PCN Test</strong></td>
<td>PCN test result(s) showing that PCN has been detected using recognised surveillance protocols and approved testing procedures and a quarantine authority has recorded the positive test result.</td>
</tr>
<tr>
<td><strong>Very low risk land</strong></td>
<td>Non linked land:</td>
</tr>
<tr>
<td></td>
<td>• with status confirmed via soil testing using recognised surveillance protocols and approved testing procedures, and</td>
</tr>
<tr>
<td></td>
<td>• of indeterminate status with no history of potato production 'virgin land'), and no history of PCN infestation for any land linked to it, and the status not is confirmed via soil testing using recognised surveillance protocols and approved testing procedures</td>
</tr>
<tr>
<td><strong>Visibly Free of Soil</strong></td>
<td>No soil visible with 'normal' eyesight that can be detached from potato tubers other than soil colour stains.</td>
</tr>
<tr>
<td><strong>Ware Potatoes</strong></td>
<td>Potatoes grown for fresh market sale.</td>
</tr>
</tbody>
</table>
4 Key Risks and Mitigation Principles

Scope

This section describes key risks posed to the Australian potato industry by PCN, based on the likelihood of PCN occurrence and spread. The potential magnitude of impact (consequences) from the presence and spread of PCN are all considered equally high. Risks have been rated in two ways:

1. Risks based on the PCN status of land (Land Risk Status categories)
2. Risks based on the potential PCN pathways (Risk Pathways)

This section also includes a summary of risk mitigation strategies, which are then outlined in detail in the protocols attached to this Plan.

Purpose

Set out a risk hierarchy for PCN infestation of land and PCN spread to form the basis for risk based surveillance and host movement conditions and enable effective and practical PCN mitigation strategies and control measures.

4.1 Entry into Australia and subsequent spread of PCN

Potato tubers, other PCN hosts, bulbs, and plant materials grown in soil in rotation with potatoes and any machinery, equipment and materials used for the production or transport of these plants entering Australia from places with known PCN infestations pose a risk of introducing PCN strains to the country.

Therefore all PCN free and control areas need to be protected from the entry of imported PCN host material or tubers, equipment and machinery or any type of containers or packaging that may carry soil from an infested area.

The entry and subsequent spread of PCN from sources outside Australia has been identified as a risk that has to be managed separately to this Plan by Biosecurity agencies based on a separate risk analysis. Industry, through AUSVEG, will comment on this analysis to ensure the Australian industry is adequately protected.
4.2 PCN risk categories for land risk status

Land used for the production of fresh market (ware) and processing potatoes

Table 4-1 describes five (5) risk categories for PCN infestation of land (land risk status). In Table 4-1 the terms ‘detection, delimiting or monitoring survey’ mean that an investigation (specific survey) which includes soil testing using approved sampling and testing procedures has been conducted for the land in question.

The use of non-PCN certified seed would increase a risk category by one (1) rating e.g. moves risk from medium to high.

Whenever livestock is moved to land of a lower risk category from higher risk land, this land the stock has been moved to will then have to be categorised with the same risk status rating as the land the livestock was moved from. The same applies to the movement of machinery and equipment if moved without adhering to the Hygiene Code of Practice laid out in Appendix 1; and conditions imposed by responsible state regulatory authorities.

Machinery and equipment that has been imported from countries with PCN infestation have to adhere to movement and hygiene protocols (Section 4.1, Appendix 1). They should be steam cleaned or otherwise disinfested before moving to the farm destination, even if exported as ‘free of dirt and debris’.

The use of PCN control measures such as adequate fumigation may lower a risk categorisation. This decision will be at the discretion of responsible state authorities.

### Table 4-1 Land risk status based PCN risk categories for processing, fresh market (ware) and seed potato production

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Very High</td>
<td>Infested land</td>
<td>PCN infestation officially verified as result of a detection, delimiting or monitoring survey</td>
</tr>
<tr>
<td>4 High</td>
<td>Linked land</td>
<td>Land having connections with officially verified infested land, meeting the definition of linked land and not officially verified as de-linked</td>
</tr>
<tr>
<td>4 High</td>
<td>Land used for potato seed production</td>
<td>Refer to the paragraph following this table</td>
</tr>
<tr>
<td>4 High</td>
<td>De-linked land growing host crops and non resistant cultivars</td>
<td>Land having had connections with infested land (including seed sources) but being officially verified as de-linked through delimiting and or monitoring surveys but put as risk through host crops² and non resistant cultivars</td>
</tr>
<tr>
<td>4 High</td>
<td>Non-linked land of indeterminate status with a history of intensive potato production growing non-resistant cultivars</td>
<td>Land with a history of potato production on 1-3 year rotations, having no known connections with infested land (including seed sources) and no history of PCN infestation based on official general surveillance³ information, and with the status not verified by a detection, delimiting or monitoring survey</td>
</tr>
</tbody>
</table>

³ Volunteer potatoes are a host crop
⁴ Refer to ‘Definitions’ in this Plan
<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Medium</td>
<td>Non-linked land of indeterminate status with a history of intensive potato production growing resistant cultivars and no host crops</td>
<td>Land with a history of potato production on 1-3 year rotations, having no connections with infested land (including seed sources) and no history of PCN infestation based on official general surveillance information, and with the status not verified by a detection survey</td>
</tr>
<tr>
<td>3 Medium</td>
<td>Non-linked land of indeterminate status with a proven history of potato production in wide rotation with non-host crops growing non-resistant cultivars</td>
<td>Land with a history of potato production on 4-5 year rotations, having no connections with infested land (including seed sources) and no history of PCN infestation based on official general surveillance information, and with the status not verified by a detection survey</td>
</tr>
<tr>
<td>3 Medium</td>
<td>Non-linked land of officially verified PCN free status growing non-resistant cultivars</td>
<td>Land for which PCN freedom has been officially verified as result of a detection, delimiting or monitoring survey and having no connection to land with a history of PCN infestation or any land linked to it and not using PCN certified seed</td>
</tr>
<tr>
<td>2 Low</td>
<td>Non-linked land of officially verified PCN area free status growing non-resistant cultivars</td>
<td>Land where PCN freedom has been officially verified as result of a detection, delimiting or monitoring survey and having no connection to land with a history of PCN infestation or any land linked to it and using certified PCN free seed only</td>
</tr>
<tr>
<td>2 Low</td>
<td>Non-linked land of indeterminate status with a proven history of potato production in wide rotation with non-host crops growing resistant cultivars</td>
<td>Land with a history of potato production on no less than 5 year rotations, having no connections with infested land (including seed sources) and no history of PCN infestation based on official general surveillance information, and with its status not verified by a detection survey</td>
</tr>
<tr>
<td>2 Low</td>
<td>De-linked land growing only non-host crops and resistant cultivars</td>
<td>Land having had connections with infested land but being officially verified as de-linked through delimiting and or monitoring surveys and using PCN certified seed</td>
</tr>
<tr>
<td>2 Low</td>
<td>Non-linked land of indeterminate status with a documented history of intermittent potato production</td>
<td>Land with a history of low intensity potato production (1 or less crops in 10 years) having no connections with infested land (including seed sources) and no history of PCN infestation based on official general surveillance information, and with its status not verified by a detection survey</td>
</tr>
<tr>
<td>1 Very Low</td>
<td>Non-linked land of indeterminate status with no history of potato production (virgin land)</td>
<td>Land never used for potato production having no connections with infested land (including seed sources) and with the status not verified by a detection, delimiting or monitoring survey</td>
</tr>
<tr>
<td>1 Very Low</td>
<td>Non-linked land of officially verified PCN free status growing resistant cultivars</td>
<td>Land for which PCN freedom has been officially verified as result of a detection survey and having no connection to land with a history of PCN infestation or any land linked to it and using certified PCN free seed only</td>
</tr>
</tbody>
</table>

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5 years without potatoes

6 refer to ‘Definitions’ in this Plan
### Key risk pathways and risk rating for PCN spread

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Very Low</td>
<td>Washed vegetable root crops for culinary purposes</td>
</tr>
<tr>
<td>2 Low</td>
<td>Vegetable root crops for culinary purposes, unwashed and free of loose soil and not from infested or linked land</td>
</tr>
<tr>
<td>2 Low</td>
<td>Potatoes for consumption (fresh market / ware potatoes), washed free of soil and handled, packed and transported according to the land risk status,</td>
</tr>
<tr>
<td>2 Low</td>
<td>Potatoes for consumption (fresh market / ware potatoes), brushed free of soil only and from areas of low and very low land risk status</td>
</tr>
<tr>
<td>2 Low</td>
<td>Potatoes for processing handled, transported and with waste managed according to the land risk status and or permits</td>
</tr>
<tr>
<td>3 Medium</td>
<td>Equipment, machinery, bins etc. and practices leading to soil movement from non-linked land of indeterminate status (with a history of intensive potato production), includes imported machinery and equipment</td>
</tr>
</tbody>
</table>

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7 refer to ‘Definitions’ in this Plan
## Risk category

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Medium</td>
<td>Nursery stock, bulbs and root crops (hosts and non-hosts) for planting from and on non-linked land of indeterminate status (with a history of intensive potato production, land risk category 4)</td>
</tr>
<tr>
<td>3 Medium</td>
<td>Potatoes for consumption (fresh market / ware potatoes), brushed and from land of medium land risk status and transported into areas of lower risk status, that are or include seed production areas with area freedom status (land risk category 1)</td>
</tr>
<tr>
<td>4 High</td>
<td>Equipment, machinery, bins etc. and practices leading to soil movement from infested or linked areas</td>
</tr>
<tr>
<td>4 High</td>
<td>Nursery stock, bulbs and root crops (hosts and non-hosts) for planting off farm produced in infested or linked areas</td>
</tr>
<tr>
<td>4 High</td>
<td>Potatoes for consumption (fresh market / ware potatoes), brushed and from high risk or infected land (land risk category 4&amp;5) transported into low risk (land risk category 1) PCN free areas producing certified seed</td>
</tr>
<tr>
<td>5 Very High</td>
<td>Seed potatoes for planting (with unknown PCN status, not certified, not from an area, property or paddock with verified area freedom status)</td>
</tr>
<tr>
<td>5 Very High</td>
<td>Tubers taken out of commercial crops as ‘one-off seed’ that are not from an area, property or paddock with verified area freedom status</td>
</tr>
</tbody>
</table>

### 4.4 Farm hygiene

The most effective way of spreading PCN cysts is in contaminated soil. Soil containing cysts can be moved by wind and water, but in most cases the greatest quantity is moved with seed potatoes, machinery, bags, bins, livestock, people and contaminated with soil. PCN is also spread through the return of tare soil from packing sheds and processing factories to agricultural land, usually to different paddocks.

Therefore any strategy to reduce the movement of foreign soil into a region or onto a farm reduces the risk of spread and infestation, not only of PCN. The PCN Hygiene Code of Practice (Appendix 1) will also restrict the spread and establishment of a wide range of other soil-borne diseases.

The implementation of stringent farm hygiene procedures and adherence to a PCN farm hygiene code of practice underpins all other risk mitigation efforts and would be part of determining a land risk status category.

### 4.5 Summary of risk mitigation principles

The PCN Plan deals with PCN risks based on land risk status and risk pathways for spread via key mitigation strategies.

The principles of risk based PCN control and management strategies are:

1. Inclusion of PCN testing into seed certification schemes and an undertaking to only use PCN certified seed i.e. the area, property or paddock where the seed is produced has official area freedom status which is maintain as per this Plan, or the seed comes from a paddock with an officially accepted testing history (accepted by responsible authorities);
2. Allocation of potato growing land to a risk category as per Table 4-1 and surveillance as required to establish or maintain official PCN area freedom;

3. An undertaking to grow varieties resistant to *G. rostochiensis*, especially in medium, high and very high risk land;

4. An undertaking to increase rotation of potato crops and PCN host crops to a minimum of four (4) years (1 year in 5), and aiming at six (6) years (1 year in 7), without growing potatoes or hosts in at least all high and very high risk land; this may change the land risk status to a lower risk rating and thus surveillance requirements;

5. Rapid response to new detections of PCN and consistent, transparent application of quarantine controls on infested, suspected infected and or linked properties;

6. Containment of existing PCN infestations and new outbreaks to delimited infested areas of land via regulation as per this Plan, including but not limited to
   a. PCN population reduction, ultimately aimed at eradication, through implementing an integrated management approach of:
      i. resistant potato cultivars,
      ii. no alternative hosts,
      iii. control of volunteer tubers (ground keepers)
      iv. four (4) year or longer rotations (recommended is a target of six (6) years i.e. 1 potato crop in seven (7) years),
      v. PCN deterrent break crops as much as available and practical,
      vi. adherence to risk management and hygiene protocols especially for the movement plant materials and equipment (Appendix 1, Table 6-1 to Table 6-4), and
      vii. documented adherence to the PCN Hygiene Code of Practice (Appendix 1) which may include fumigation;
   b. Implementation of appropriate

7. Exclusion of PCN from verified PCN free areas by placing strict quarantine requirements on the movement of all host material including soil into protected seed and other protected production areas (districts or zones);

8. Ongoing delimiting and monitoring surveys of infested and linked (high risk) land to confirm that integrated land management practices successfully convert infested to linked land, linked to non-linked land and ultimately lead to eradication of the pathogen;

9. For all other land risk status areas (i.e. medium to very low Table 4-1) to achieve and or maintain officially verified PCN area free status;

10. Adoption of accepted national surveillance, accreditation, certification and labelling standards to harmonise trade within Australia for host material of the pest.
5 **Surveillance - Determining the PCN Status of Land**

**Scope**

This section describes general requirements on how often, when and how to determine the PCN status of land, based on the risk categorisation of land (Land Risk Status) to:

- maintain or gain official area free status from PCN for land being used for the production of potatoes;
- detect and delimit PCN on infested and linked land;
- officially control the spread of PCN from areas found to be infested; and
- effectively manage risks based on the land risk status and pathways for spread.

It sets out minimum requirements for PCN surveillance based on risks:

1. **Official general surveillance of**:
   a. very low and low risk land used for the production of processing and fresh market crops, and
   b. very low risk land (virgin land) used for the production of seed potato crops (crops having tubers intended for replanting).

2. **Official specific surveys**\(^8\) covering medium, high and very high risk land areas used for the production of potatoes other than seed potatoes in order to:
   a. determine the absence or presence of potato cyst nematodes through detection surveys or monitoring surveys, and if present,
   b. determine the distribution of potato cyst nematodes through detection and delimiting surveys;

3. **Official detection surveys for seed certification schemes** to ensure that no potato cyst nematodes are found in land areas that do not have area, property or paddock freedom status with officially accepted and ongoing monitoring programs, in which seed potatoes intended for the production of seed or commercial potato crops, and certain plants intended for the production of plants for planting (planting stock), off farm are planted. Ideally seed growing areas should be tested one year prior to intended planting.

**Purpose**

The purpose of this section is to set out minimum requirements for establishing the PCN status of land.

5.1 **Minimum requirements for PCN surveillance**

The minimum requirements in determining and maintaining PCN free status for land are:

- Registration of all businesses growing, packing and processing potatoes with the responsible regulatory authority who will maintain registration records in an appropriate database;

\(^8\) Specific surveys: detection, monitoring or delimiting surveys based on soil testing
Registered businesses to keep a log of contractors and transport operators they are using and ensure that these adhere to the PCN Hygiene Code of Practice and movement conditions off farm (Appendix 1, Table 6-1 to Table 6-4) as appropriate;

- Risk categorisation of registered farms (or production units as required) based on information provided as part of the registration process;
- Risk-based surveillance as required to establish and or confirm PCN status;
- Farm record keeping about seed sources, rotation crops, varieties and surveillance results for all potato production units;
- Prevention of entry of potentially infested host material, plants, and equipment; and
- Official recording and reporting to verify PCN free area status for areas, properties or paddocks.

Surveillance requirements will commence with the date of endorsement of this Plan. This will not affect or change the PCN area free status of land officially endorsed prior to the authorisation of this Plan.

**Table 5-1 Minimum PCN surveillance requirements to establish and maintain PCN pest area freedom for land used for the production of fresh market (ware) and processing potatoes**

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Surveillance type</th>
<th>Soil testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Very low</td>
<td>General surveillance</td>
<td>Official and on farm record keeping required (e.g. official state and / or federal database and on farm HACCP)</td>
</tr>
<tr>
<td>2 Low</td>
<td>Detection, delimiting or monitoring survey using officially accepted protocols (by Plant Health Committee and / or state authorities)</td>
<td>To maintain area, property or paddock freedom (i.e. as per ‘Medium’ risk or otherwise agreed by responsible authorities)</td>
</tr>
<tr>
<td>3 Medium</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4 High</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5 Very high</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Surveillance via soil testing for ‘Low’ and ‘Very Low’ risk land may be asked for in trading agreements. This requirement, including surveillance methods, would be negotiated between the parties concerned and stated in separate documentation.

As required, overall guidance on general surveillance and detection, delimiting or monitoring surveys should be taken from ISPM 6 (1997) and McMaugh (2005)\(^9\).

### 5.1.1 General surveillance – confirming the land risk status

Following the process of registering potato businesses, general surveillance will be used to establish the land risk status and through that the need for specific surveys involving certain levels of soil testing explained in this section of the Plan. General surveillance may also

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9 HCCP: Hazard Audit Critical Control Point system (similar to those used for food safety
McMaugh T 2005: Guidelines for Surveillance of Plant Pests in Asia and the Pacific. ACIAR Monograph No.119
assist in determining requirements for the purpose of establishing and maintaining area freedom from PCN.

**Information and data sources for general surveillance**

The following sources of information may be used at a minimum for general surveillance:

- Farm records (QA documents, diaries etc.) on seed sources, lengths of rotation, rotation crops, livestock movement, volunteer potato control, varieties grown, livestock and machinery hygiene procedures, control of volunteer potatoes etc.
- Any existing officially verified PCN survey information e.g. conducted and held by national, or state government agencies, research institutions, universities.

**Collection, storage and retrieval of general surveillance information**

To utilise data from sources suitable for providing general surveillance information, state and / or national plant health agencies need to have or implement a record keeping and retrieval system whereby appropriate general surveillance information on the PCN status of land areas used for potato production is collated, verified and recorded.

Components of such a system may include but not be limited to data verification procedures and communication protocols between agencies.

If sufficient general surveillance data for land is not available to achieve a risk classification in the categories of ‘Low’ or ‘Very Low’, then the classification has to be ‘Medium or ‘High’ depending on circumstances and requirements of responsible authorities.

**5.1.2 Specific surveys and recommended minimum sampling regimes for PCN**

Specific surveys need to be conducted for all land areas in a potato production rotation that have been classified in the medium, high and very high-risk categories. Negative detection surveys as per this Plan may change an initial Medium risk rating for land to a Low or Very Low or a High to Medium, thus eliminating or reducing the need for soil testing.

A documented and verifiable change in management practices may also be accepted to achieve reclassification of the risk category.

A positive PCN test from a detection survey changes the land risk rating to ‘Very High’ for the land in question and ‘High’ for all linked land and regulation including surveillance will be implemented based on this Plan and potentially additional requirements imposed by local quarantine authorities.

**Detection surveys to determine PCN free areas**

For Medium, High and Very High risk categories a detection survey will establish whether PCN is absent or present in a land area. The term PCN pest free area (PFA) can be applied to an area of any size that is verified to be free of PCN (e.g. pest free paces of production (PFPP) or pest free production sites (PFPS)). ISPM 4 (1995)\(^ {11} \) provides guidance on how to

establish pest free areas, and ISPM 10 (1999)\(^2\) on how to establish pest free places of production and pest free production sites.

Detection surveys may be asked for ‘Low’ risk land, if negotiating and or maintaining market access and general surveillance information is not considered sufficient by the trading partner to officially recognise a PCN free area.

PFPP and PFPS: Depending on the circumstances, an importing country may require that pest free area status be verified for ‘one or more years’ before the year in which export would commence, or simply from the year of export onwards for any of the risk categories.

**Monitoring surveys**

ISPM 5\(^3\) defines a monitoring survey as an ongoing survey to verify the characteristics of a pest population. By this definition, PCN monitoring surveys apply where PCN is known to be present and the survey is planned to examine aspects of the PCN population such as the prevalence and changes in prevalence over time.

These official monitoring surveys are used to assist with PCN management such as controlling the risk of spread and or assessing the efficacy of an eradication program.

Monitoring surveys may also be used to support areas of low pest prevalence (ALPP) status. According to ISPM 22 (2005)\(^4\) an ALPP is defined as an area, whether all of a country, part of a country, or all or parts of several countries, as identified by the responsible authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, controls or eradication measures.

The main difference between an ALPP and a PFA is that the presence of the pest below a specified population level is accepted in an ALPP, whereas the pest is absent from the PFA.

This means that, in some cases, a low population of the pest can be tolerated on the imported commodities, and phytosanitary measures can be employed (from planting to selling) to manage the pests to a level acceptable to the importing country.

For buffer zones around ALPPs, PFPPs and PFPSs monitoring surveys need to be conducted at adequate frequency over one or more growing seasons or as required e.g. by state or national authorities or trading partners.

**Delimiting surveys**

ISPM 6, Guidelines for Surveillance, defines a delimiting survey as a survey conducted to establish the boundaries of an area considered to be infested by a pest or free from a pest rather than to define an area that is pest free or infested.

The site where PCN is detected might not be the initial site of the (start of) infestation. A delimiting survey should therefore also be used to identify the original source (‘trace-back’),

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and tracing the possible spread (‘trace-forward’) i.e. locate areas that might be infested from the original or other sources and will need to be surveyed.

Determining where a PCN infestation originated and to where the pest might have spread will determine where the surveying and resources for management need to be focused.

5.2 Standard soil sampling of production units

If PCN area freedom is required to be established for Very High, High and Medium risk land, land in potato production in any one year should be surveyed via soil testing for PCN until all land of the relevant risk status in the area in question has been investigated. Some jurisdictions may require sampling of a buffer zone of up to 20 km surrounding the area in question. This may depend on the risk status of the said area. Some jurisdictions may not require 100% land in question to be surveyed. Some jurisdictions may require some low risk land to be surveyed depending on circumstances. Post-crop testing is recommended.

General guidance on designing testing surveys may be taken from McMaugh (2005).

5.2.1 Sampling for detection and monitoring surveys

For ‘High’ and ‘Medium’ risk land the ‘National Protocol for Soil Sampling and testing for PCN’ (Hinch, 1991, National Protocol) should be followed at a minimum.

‘Very High’ risk (infested) land require high intensity monitoring (and delimiting – see below) surveys to establish the distribution and boundaries of infestation. Routine monitoring for Very High risk land, to be used after the initial high intensity testing phase, should be based on the EU Directive (European Union Directive 2007/33/EC based on PVNA/2002/655R8), and as suggested by Been and Shoemaker (1991) to increase the sensitivity of testing by analysing a larger volume of soil. Alternatively the Australian Standard testing procedure may be used depending on decisions by responsible authorities.

For medium risk land, soil sampling may be based on the EU directive for lower risk (#4, Table 5-2) land for 100% of a paddock or higher intensity testing (# 1,2,3).

Table 5-2 summarises testing details for the different land risk status categories. Post-crop testing is recommended.

5.2.2 Sampling for delimiting surveys

Following PCN discovery by a detection or monitoring survey, high intensity soil testing should be used immediately and continue for as long as required to adequately monitor and delimit the severity, distribution and boundaries of PCN infestation. The high intensity test requires sampling on a 5 x 5 m grid or equivalent to collect 4 kg of soil per hectare all of which is analysed (Table 5-2).

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15 Low and very low risk land may require soil surveys instead of general surveillance if requested by responsible authorities.
17 Land where PCN has been detected using National Protocol procedures or testing of soil from equipment and machinery (the later only if accepted as a procedure by responsible authorities)
5.3 **Soil sampling from potato machinery and equipment**

Soil collected during the harvesting or grading process may be used for detection surveys if sampling can be conducted using an officially accepted sampling method that provides representative, traceable results for defined production units (paddocks).

Sampling from potato machinery and equipment could be an efficient and cost effective method for detection and potentially monitoring surveys. This methodology should not be used for land that has already been categorised as infested or linked unless sufficient scientific research data has shown this to be suitable. The Plant Health Committee and or responsible authorities would have to confirm for which land risk category sampling from machinery or equipment would be permissible and determine Standard PCN Sampling Protocols for Machinery and Equipment. A draft protocol can be found in Appendix 2. The size (weight or volume) of a sample collected per hectare by these methods would have to match the size required for field sampling. On the discretion of responsible state authorities, sampling from machinery or equipment may then be used as an alternative to soil sampling from paddocks.

5.3.1 **Sampling from harvesters**

For ware, processing and seed potatoes it may be feasible to collect random soil samples during the harvesting process e.g. from soil that falls through a web. This procedure could be used for all crops that are washed without any prior ‘dry grading’ on a grading line. Collection from harvesters as compared to grading lines also allows clear traceability to a production unit and easier representative sampling. This methodology is so far untried and therefore the following needs to be determined at a minimum under guidance from industry and the Plant Health Committee:

- A safe and simple method of collecting soil samples of a suitable size and quality from different potato harvesters
- Responsibilities for sampling, and submission of samples to an certified laboratory
- How to ensure a representative sample is taken for a production unit/paddock:
  - How often and where, in which pattern to take subsamples in a production unit/paddock to get a representative bulk sample;
  - The volume of each subsample going into the composite, bulk sample;
  - The methodology of subsampling the composite, bulk sample, including the required volume to take for submission to the laboratory (to be consistent with field surveys);
  - Sample handling and storage prior to submission to the lab;
  - The types of harvesters not suitable for this method of sampling (e.g. twin row diggers).

5.3.2 **Sampling from grading lines**

For ware, processing and seed potatoes it is considered feasible to collect random soil samples during the grading process e.g. from soil that falls through the pintle rollers or similar pre-grading/cleaning set up used prior to sizing. This procedure could be used for crops that are not washed. This methodology is so far untried in different Australian grading
operations. Therefore the following needs to be determined at a minimum under guidance from industry and the Plant Health Committee:

- A way of clearly tracing a sample back to a production unit e.g. as part of an overall QA system;
- How a grading line must be cleaned of all loose dirt between grading potatoes from different production units;
- A safe and simple method of collecting soil samples of a suitable size and quality from different grading lines;
- Responsibilities for sampling, and submission of samples to an certified laboratory
- How to ensure a representative sample is taken for a production unit/paddock:
  - Where, how and how often to take a subsample from a grading line to create a representative bulk sample for each production unit;
  - The volume of each subsample going into the composite, bulk sample;
  - The methodology of subsampling the composite, bulk sample, including the required volume to take for submission to the laboratory (to be consistent with field surveys);
  - Sample handling and storage prior to submission to the lab.

5.3.3 Sampling from bins

Sampling from bins coming off paddocks is considered a very poor option for detection and monitoring surveys. ‘Bins’ refers to ½ or 1 tonne bins as well as any type of bulk bin. While this type of sampling could potentially be useful for crops that are brushed or washed without any prior ‘dry grading’ (used instead of sampling from harvesters), collection from bins as compared to harvester or grading lines will most likely not allow clear traceability and is unlikely to provide a representative sample for a production unit. This methodology is so far untried. If the Plant Health Committee would want to take a closer look at options of sampling from bins the following would need to be determined, also taking advice from industry:

- A way of clearly tracing a sample back to a production unit e.g. as part of an overall QA system;
- How all types of bins must be cleaned of all loose dirt before commencing transport of tubers from different production units to a packing or processing facility, irrespective of land risk status;
- A safe and simple method of collecting soil samples of a suitable size and quality from different types of bins;
- Responsibilities for sampling, and submission of samples to an certified laboratory;
- How to ensure a representative sample is taken for a production unit/paddock:
  - Where, how and how often to take subsamples from different types of bins to create a representative bulk sample for each production unit;
  - The volume of each subsample going into the composite, bulk sample;
  - The methodology of subsampling the composite, bulk sample, including the required volume to take for submission to the laboratory;
  - Sample handling and storage prior to submission to the lab.
5.4 Summary of minimum surveillance requirements

Table 5-2 provides a summary of minimum surveillance requirements based on land risk status. The Plant Health Committee, (the PCN Plan implementation task force, if instated) and or responsible state authorities will ultimately finalise the use of survey methods based on risk categories and the recommended minimum surveillance requirements for categories of land. The same will apply to grower, packer and processor, as well as sampling, analytical services and other registration, certification and data management requirements.

Table 5-2  Sampling a hectare of land in a potatoes production unit

<table>
<thead>
<tr>
<th>#</th>
<th>Number subsamples per sample to submit for testing taken per 1 ha sampling area</th>
<th>Sampling pattern</th>
<th>Sample volume / ha to be analysed the certified testing laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delimiting and Monitoring Surveys for Very High Risk Land after PCN Detection - Initial High Intensity Sampling</td>
<td>5 x 5 m</td>
<td>2kg (4 kg per 2ha)</td>
</tr>
<tr>
<td></td>
<td>100 x 10 cm³ cores to a depth of 10 cm per ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(200 x 10 cm³ cores to a depth of 10 cm per 2 ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ongoing Monitoring of Very High Risk Land and Detection Surveys for High Risk Land – EU Directive (alternative to Australian Standard)</td>
<td>20 x 5 m</td>
<td>1.5 litres</td>
</tr>
<tr>
<td></td>
<td>100 narrow cores (2 cm diameter corer) to a depth of 25 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Monitoring / Detection Surveys for High Risk Land including Seed - Australian Standard</td>
<td>10 x 10 m</td>
<td>0.5 kg</td>
</tr>
<tr>
<td></td>
<td>100 x 10 cm³ cores to a depth of 10 cm (= 200 cores per 2 ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatively as permitted by responsible authorities – based on Australian Standard</td>
<td>Training sampling of high risk zones in the production unit – 50% of area = 0.5 ha of 1 ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 x 10 cm³ cores to a depth of 10 cm (= 100 cores per 2ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Monitoring / Detection Surveys for Medium Risk Land – based on Australian Standard</td>
<td>10 x 10 m</td>
<td>0.25 kg (0.5 kg per 2 ha)</td>
</tr>
<tr>
<td></td>
<td>Targeted sampling of high risk zones in the production unit – 50% of area = 0.5 ha of 1 ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 x 10 cm³ cores to a depth of 10 cm (= 100 cores per 2ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatively as permitted by responsible authorities – based on Australian Standard</td>
<td>Training sampling of high risk zones in the production unit – 30% of area = 0.33 ha of 1 ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 x 10 cm³ cores to a depth of 10 cm (= 100 cores per 2ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Alternatively as permitted by responsible authorities – “EU Directive for lower risk land”</td>
<td>20 x 5 m</td>
<td>0.4 litres</td>
</tr>
<tr>
<td></td>
<td>100 narrow cores (2 cm diameter corer) to a depth of 25 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Low and Very Low Risk Land – General surveillance required (paddock registration and appropriate crop and rotation records)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For the 20 x 5 m grid sampling, the longest dimension should be parallel to the direction of cultivation.

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18 Headlands, areas where bins are dropped, loading areas - target areas need to be GPSed
19 Headlands, areas where bins are dropped, loading areas - target areas need to be GPSed
20 Headlands, areas where bins are dropped, loading areas - target areas need to be GPSed
N.B. Testing by soil volume would be more accurate than sampling by weight. Based on the bulk density of a soil, a certain weight may have quite different volumes.

For category # 3 and # 4 in Table 5-2, sampling from machinery and equipment may be an option if the conditions mentioned under section 5.3 can be met, and depending on decisions by the Plant Health Committee and or individual responsible state agencies. This type of sampling, if done to a consistent standard, is expected to have a better cyst detection probability because the soil that is collected would be mostly form directly around tubers and roots. It could therefore provide industry with better information on the status of land and ability to protect PCN free land.

Sampling from machinery and equipment is not recommended for seed certification and infested or linked land without further scientific investigation of suitability. Ideally, paddocks to be used for seed production should be tested one year prior to production commencing.

Further details on recommended survey methods are given in Appendix 2 (Field surveillance for PCN (Draft)) and Appendix 3 (PCN Surveillance via Soil Sampling from Machinery and Equipment (Draft)).

Sampling personnel and growers or their staff who want to conduct their own sampling program must be trained and their capability acknowledged via a certificate. Sampling services and self-sampling farms should be audited at least every three years.

N.B.: The sampling and testing procedures in the Plan are a considered starting point for discussion. They therefore will require final review by the Plant Health Committee and or the PCN Plan implementation task force (if installed).
6 Managing Risk Pathways

Scope

This section describes the management of all risk pathways, starting with the highest risk, which are seed potatoes, and describing movement conditions for plants and objects from and between areas with different infestation and land risk status.

Purpose

The purpose of this section is to ensure the management of all risk pathways is clearly understood.

6.1 PCN Certification of Seed

Potato seed and all other potato tubers used for planting of crops pose the highest risk of spreading PCN (Washington et. al. 2008, European Council Directive 2007/33/EC (2007)). Therefore seed potato crops and potato tubers from commercial crops destined for commercial crop production should not be grown, sold and or used in Australia without PCN certification. All seed producers and growers selling seed from commercial crops should to be registered under certified schemes in all states.

Officially PCN certified Seed tubers are:

1. from an officially verified, maintained PCN free area, property or paddock; or
2. have an officially verified negative test result for PCN for the paddock the seed is produced on.

The National Standards for the Certification of Seed Potatoes already requires testing for PCN of all certified seed as per the below:

Extract from the National Standards Potato for the Certification of Seed Potatoes:

**Cyst Nematode (PCN)**

10. Seed can be produced only on properties where the certifying authority is satisfied that there is no apparent risk of PCN being present (Refer rule 27). Export crops must be tested according to the prevailing phytosanitary requirements of the importing country.

11. Where PCN testing is required, seed can only be grown on land where a negative result has been obtained from a soil testing program using a PCN detection protocol similar to that detailed in appendix 1, or as approved by the Australian Quarantine and Inspection Service. Under no circumstances can seed be grown on land which has previously grown bulbs, corms, or tubers introduced from areas where PCN is known to occur.


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Farm saved seed for planting on the same property would be exempt from certification requirements.

In areas that have official area freedom general surveillance must continue. Refer section 4.2. for ongoing soil testing requirements. Ideally, paddocks to be used for seed production should be tested one year prior to production commencing.

6.2 Area, Property and Paddock Freedom

Seed produced in areas that have achieved area freedom from PCN will require ongoing PCN certification. If area freedom status is suspended, seed surveillance requirements and movement conditions may change depending on issues and conditions set by the responsible authorities.

Area, property and paddock freedom from PCN for seed growing will be recognised following a government verified PCN survey program (refer to section 5 ‘Determining the PCN Status of Land’).

6.3 Additional Requirements

Areas established as PCN pest free areas for the purpose of potato seed production including down to paddock level must have restrictions placed on entry of host material, as well as dirty bins, equipment and any other plant or packaging materials, livestock and people which carry soil. The use of PCN certified seed should be enforced. Ideally, paddocks to be used for seed production should be tested one year prior to production commencing. In addition, whole of industry driven signage and awareness programs must be put in place to help ensure ongoing prevention of PCN entry.
6.4 General Movement Conditions

Each jurisdiction can apply amended regulatory regimes based on regional differences in the PCN risk profile. The following provides minimum requirements for harmonised movement conditions for PCN host material originating from land with varying levels of risk (infested, linked, non-linked). The conditions apply a combination of mitigation measures which can be used in a systems approach including:

- The use of secure pathways including for specified low risk end uses (e.g. potatoes from infested land for processing);
- Area, property or paddock freedom as validated by surveillance;
- Soil testing to provide evidence of absence of PCN for linked and non-linked land of indeterminate high risk land PCN status;
- Soil removal through mechanical means such as brushing or washing;
- Soil removal or treatment through steam or heat cleaning;
- Soil exclusion through above ground production and use of soil less medium;
- Accreditation to validate implementation of measures;
- Identification of host materials to facilitate trace back purposes; and
- Record keeping and auditing as required.

Movement conditions are summarised in Tables 6.1 to 6.4 and are subject to approval by the responsible state authority. This will need to be obtained from authorities prior to states/territories’ introducing legislative changes to current prohibitions.
6.4.1 Infested land

Table 6-1 Movement Conditions from Infested Land

<table>
<thead>
<tr>
<th>Item</th>
<th>Infested Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>Prohibited.</td>
</tr>
</tbody>
</table>
| Ware | Allowed under Government permit:  
Washed to remove soil to standard.  
Non resistant cultivars not allowed after the first crop following detection. Movement only under government permit and protocol.  
Packed for sale in approved sized bags labelled “Not for planting” or  
Transported under permit only to a certified packing facility not in a PCN free area for packing while segregated from other uncleaned potatoes and potatoes from non-linked land.  
Marked or identified with grower’s or packer’s name and locality.  
Inspected and certified with PHC or PHAC  
Market /processed through a secure supply chain for specified end uses.  
Potatoes from infested land not allowed into PCN area free zones.  
Waste secured on farm or at the certified packing facility, or to secure landfill/sewer or treated to disinfest PCN, and not allowed to enter potato production areas. |
| Processing | Allowed under Government permit:  
Potatoes from infested land are not allowed entry into declared PCN area free zones.  
Washed or brushed (for PCN resistant cultivars only) to remove soil before leaving the infested area.  
If not cleaned before leaving the infested area, tubers must be harvested under soil moisture conditions that allow removing a maximum amount of soil from tubers and transported under security with an approved declaration or PHC or PHAC to a certified processing facility.  
Marked or identified with grower’s name and locality.  
Washed and processed in a certified processing facility.  
Waste containing soil to be secured on infested area or at the certified processing facility or to secure landfill/sewer or treated to disinfect PCN, and not allowed to enter potato production areas. |
| Field grown ornamentals, bulbs, trees and turf for planting, root crops for culinary use | Allowed under government permit and accreditation:  
Plants grown above ground in soil less mix – no further measures.  
In ground grown plant parts – washed free of soil, for use in urban areas.  
Inspected and certified with a PHC.  
Packed in clean containers.  
Marked with grower’s name and address.  
Not allowed to enter potato production areas. |
| Equipment and Containers | Allowed under government permit.  
Cleaned by appropriate steam cleaning or moist heat treated.  
Inspected and certified with a PHC.  
Not allowed to enter PCN free potato production areas. |
| Waste | Allowed under government permit following treatment or for approved uses, Not allowed to enter potato production areas. |

1Resistant cultivars must be used on infested land subsequent to the first crop following detection. All infested land under management using G. rostochiensis Ro1 resistant cultivars will require testing after every third crop to determine if other pathotypes or G. pallida have emerged. If Globodera pallida or other pathotypes of G. rostochiensis are detected and deemed eradicable, cultivation of all host material will be prohibited. 2Disinfestation protocols as per this Plan.
### 6.4.2 Linked land

#### Table 6-2  Movement Conditions from Linked Land

<table>
<thead>
<tr>
<th>Item</th>
<th>Linked Land (Buffer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>Prohibited</td>
</tr>
<tr>
<td>Ware</td>
<td>Allowed under Government permit.</td>
</tr>
<tr>
<td></td>
<td>Year 1:</td>
</tr>
<tr>
<td></td>
<td>Negative standard pre-plant PCN test to establish that the land does not have infested status and washed to standard.</td>
</tr>
<tr>
<td></td>
<td>Waste secured on farm or at the certified packing facility and not allowed to enter PCN area free zones nor allowed to be sent to PCN free properties/paddocks.</td>
</tr>
<tr>
<td></td>
<td>Subsequent years:</td>
</tr>
<tr>
<td></td>
<td>Negative standard pre-plant PCN test to establish that the land does not have infested status and</td>
</tr>
<tr>
<td></td>
<td>▪ Resistant cultivars* brushed or washed to standard; and</td>
</tr>
<tr>
<td></td>
<td>▪ Non-resistant cultivars washed to standard</td>
</tr>
<tr>
<td></td>
<td>If paddocks have been tested using an accepted method and have been officially declared PCN free, and tubers have been brushed or washed for resistant varieties and washed for all other varieties as per the above, waste does not have to be treated. Still, this untreated waste from linked areas is not allowed to enter declared PCN area or property/paddock free zones</td>
</tr>
<tr>
<td></td>
<td>All crops including year 1:</td>
</tr>
<tr>
<td></td>
<td>Brushed potatoes marketed in approved sized bags/containers each labelled “Not for planting” (clean washed potatoes exempt from this requirement).</td>
</tr>
<tr>
<td></td>
<td>Packed for sale on farm and marked or identified with grower’s name and locality or</td>
</tr>
<tr>
<td></td>
<td>Transported with an approved declaration to an certified packing facility for packing under segregation and marked or identified with packer’s name and locality.</td>
</tr>
<tr>
<td></td>
<td>Inspected and certified with a PHC or a PHAC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Processing</th>
<th>Allowed under Government permit.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1:</td>
</tr>
<tr>
<td></td>
<td>Negative standard pre-plant PCN test to establish that the land does not have infested status and washed to standard.</td>
</tr>
<tr>
<td></td>
<td>Waste secured within the control zone or at the certified processing facility where it should be composted or heat-treated (moist heat at 55°C for 2 hours). Untreated waste is not allowed to enter declared PCN area free zones.</td>
</tr>
<tr>
<td></td>
<td>Subsequent crops:</td>
</tr>
<tr>
<td></td>
<td>Resistant cultivars: brushed or washed to the standard on farm or at approved facility or</td>
</tr>
<tr>
<td></td>
<td>Non-resistant cultivars: washed to standard on farm or at processing facility.</td>
</tr>
<tr>
<td></td>
<td>If paddocks have been tested using an accepted method and have been officially declared PCN free, and tubers have been brushed or washed for resistant varieties, and washed for all other varieties, waste does not have to be treated. Untreated waste from linked areas is not allowed to enter declared PCN area free zones</td>
</tr>
<tr>
<td></td>
<td>All crops including year 1:</td>
</tr>
<tr>
<td></td>
<td>Marked or identified with grower’s name and locality.</td>
</tr>
<tr>
<td></td>
<td>Inspected and certified with a PHC or a PHAC.</td>
</tr>
<tr>
<td></td>
<td>Transported with an approved declaration to a certified processing facility.</td>
</tr>
<tr>
<td></td>
<td>Processed in a certified processing facility.</td>
</tr>
</tbody>
</table>

<p>| Field grown ornamentals, bulbs, trees and turf for planting, root crops for culinary use | Allowed under government permit and accreditation. |
|                                                                                       | Packed in clean containers marked with grower’s name and locality.                |
|                                                                                       | Inspected and certified with a PHC or a PHAC.                                     |
|                                                                                       | Plants grown above ground in soil less mix - no further measures.                 |
|                                                                                       | In ground grown plant parts – negative standard PCN test of 30% of in ground production area or washed free of soil. |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Linked Land (Buffer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment and Containers</td>
<td>Allowed under government permit.</td>
</tr>
<tr>
<td></td>
<td>Cleaned by steam cleaning or given moist heat treatment.</td>
</tr>
<tr>
<td></td>
<td>Inspected and certified with a PHC or a PHAC.</td>
</tr>
<tr>
<td>Waste</td>
<td>Allowed by government permit for approved uses.</td>
</tr>
<tr>
<td></td>
<td>Waste not allowed to enter PCN area free zones nor allowed to be sent to PCN free</td>
</tr>
<tr>
<td></td>
<td>properties/paddocks.</td>
</tr>
</tbody>
</table>

* Land under management using *G. rostochiensis* Ro1 resistant cultivars will require testing after every third crop to determine if other pathotypes or *G. pallida* have emerged.
### 6.4.3 Non-linked high risk land with indeterminate status

Table 6-3 Movement conditions from non-linked high risk land with indeterminate PCN status

<table>
<thead>
<tr>
<th>Item</th>
<th>Non-Linked Land – High Land Risk Status</th>
</tr>
</thead>
</table>
| **Seed** | Allowed with accreditation.  
Area freedom certificate or negative PCN test on 100% of the crop area.  
Brushed to standard.  
Marked or identified with grower’s name and locality.  
Certified Seed Authority certification or with a PHC or a PHAC. |
| **Ware** | Allowed with accreditation.  
PCN detection survey with negative result(s) and brushed to standard.  
Or  
Washed to standard.  
Or  
As otherwise required by responsible Authorities.  
Marked or identified with grower’s name and locality.  
Certified with a PHAC*. |
| **Processing** | Allowed with accreditation.  
And  
Brushing or washing as required / approved by responsible Authorities  
Marked or identified with grower’s name and locality.  
Certified with a PHAC*. |
| **Field grown ornamentals, bulbs, trees and turf for planting, root crops for culinary use** | Allowed if certified as being grown on non linked land. |
| **Equipment and containers** | Allowed without measures. |
| **Waste** | Allowed without measures. |

* Plant Health Assurance Certificate.
### 6.4.4 Non-linked land with low and very low land risk status and land with PCN free status

**Table 6-4  Movement conditions from non-linked land with low and very low land risk status and approved PCN free status**

<table>
<thead>
<tr>
<th>Item</th>
<th>Verified PCN Free Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>Allowed with certified seed documentation (e.g. label) or under certification via a valid official area freedom certificate. Marked with grower’s name and locality. Certified as originating from a PCN certified seed scheme or with a PHC or PHAC, which includes a negative PCN testing result.</td>
</tr>
<tr>
<td>Ware</td>
<td>Allowed under an area freedom certificate or with a property or paddock PCN free certification. Marked with grower’s name and locality.</td>
</tr>
<tr>
<td>Processing</td>
<td>Allowed under an area freedom certificate or with a property or paddock PCN free certification. Marked with grower’s name and locality.</td>
</tr>
<tr>
<td>Field grown ornamentals, bulbs, trees and turf for planting, root crops for culinary use</td>
<td>Allowed without measures</td>
</tr>
<tr>
<td>Equipment and containers</td>
<td>Allowed without measures</td>
</tr>
<tr>
<td>Waste</td>
<td>Allowed without measures.</td>
</tr>
</tbody>
</table>

*This applies to movement of host material from states/territories or areas thereof that are recognised nationally as PCN free areas. These need to have relevant surveillance completed (see section 5, Determining the PCN Status of Land).*
7 Record Keeping and Reporting

A national status database and map based on current surveillance will need to be compiled and updated regularly. The database will reflect surveillance information provided by each jurisdiction. The maintenance of regional data, its accuracy, and provision to the national status database and map are the responsibility of each jurisdiction. Data, systems and records should be provided for audit and compliance purposes on request of an importing Australian jurisdiction, or for international export certification, to the Commonwealth. Data must be compiled in a consistent format and shared with BioSIRT or equivalent database systems.

Each jurisdiction has to have a database to register potato businesses and compile relevant surveillance, accreditation and auditing information.

Access to these databases has to be strictly controlled and restricted.

Further references

Biosecurity New Zealand 2009 MAFBNZ Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart) V10
Attachments – PCN Protocols

Dr David Beardsell has developed the attached protocols. Some adjustments were made to them, either for clarification or to accommodate surveillance based on land risk status.

Further protocols may need to be developed prior to or as part of implementation depending on requirements of responsible authorities. They include but may not be limited to:

- Registration process for potato businesses
- Accreditation of potato businesses
- General surveillance to determine the land risk status and specific survey protocols
- Auditing of potato business and official record keeping
- Record keeping and reporting
- Accepted testing procedures
- PCN testing laboratory accreditation procedures
- Eradication of PCN
Establishing and Maintaining PCN Free Status

Scope

Below protocols enable ongoing validation of PCN free status for a defined area of non-linked land that has never had a history of PCN detection.

Purpose

To set out how area freedom including property and paddock PCN freedom protocols (PFPP, PFPS) for potato rotation land can be established through:

- general surveillance:
  - very low and low risk land categories;
  - verified proof of previous records of three negative PCN tests for the land over a ten-year period and no linkages to infested land since the last test;
- testing as free of PCN according to this Plan using detection surveys.

Area Freedom Protocols

Only non-linked land can be considered for paddock freedom determination. Paddocks within properties that have associated infested or linked land do not qualify for area freedom status. The paddock must have clearly defined boundaries and be mapped so as to show permanent boundaries.

The following protocol applies to establishing PCN freedom for a defined area of non-linked land. The survey area must have clearly defined, fixed boundaries, have a GPS reference and be mapped to show the boundaries and the tested properties, paddocks and areas within.

Initial surveillance to establish area freedom

For low and very low risk categories general surveillance information confirming the low or very low risk status of land has to be recorded and verified for the defined area in question.

Or

Survey sampling to be conducted after potato harvest on the basis of:

- The standard Australian soil test or testing as per the EU Directive of a minimum of 30% of the defined area of each and all paddocks in current production in the defined area in any one year for high risk land (refer to Table 5-1).

Sampling should focus on areas of a paddock that represent high risk areas such as paddock areas where water may run to during rain, headlands where bins are dumped, near the entrances to paddocks and turnaround areas at the end of cultivation rows (USDA, 2009)22, areas of poor growth etc. If target areas cannot be clearly identified (described by appearance and GPS coordinates), the entire field needs to be sampled.

22 USDA 2009: Pale Potato Cyst Nematode National Survey and Diagnostic Cyst Sample Forwarding Protocols
Refer to procedures and described in Appendix 2 (Field surveillance for PCN (Draft)) and Appendix 3 (PCN Surveillance via Soil Sampling from Machinery and Equipment (Draft))

In paddocks smaller than 3 ha an area of at least 1 ha needs to be sampled. If a paddock is smaller than 1 ha at least 30 cores are needed however small the area to be sampled.

Paddocks (production units) larger than 20 ha should be split into 20 ha units and one sample taken per 20 ha.

Paddocks (production units) should also be split into separate sampling units if:

- The area has been split cropped with potatoes in the past;
- Soil types vary significantly;
- The production unit recently consisted of several smaller paddocks in a cropping rotation with potatoes; in this case the area should be sub-divided by old paddock boundaries;

The sampling regime may need to be repeated for a minimum of three (3) years before PCN area freedom will be granted by other jurisdictions. Other jurisdictions may impose additional requirements depending on a separate official assessment of risks.

**Follow Up Surveillance to Maintain Area Freedom**

Once a defined area has initially demonstrated freedom from PCN, it will need to remain under general surveillance on an ongoing basis to maintain evidence of PCN freedom. Area freedom will also require low level monitoring surveys (soil testing), as there always is a risk of infested material (tubers, host material, equipment etc.) being brought into the area illegally. This ongoing monitoring will also be required to satisfy trading partners (Note: this monitoring approach has to be similar to that of fruit fly area freedom management, which requires ongoing monitoring of fruit fly free areas to satisfy trading partners).

To maintain the PCN pest area free status all equipment and containers entering the land from another area will need to be pre-cleaned free of soil. Only PCN certified seed (verified negative PCN test or PCN certified based on its origin from an officially verified PCN free area) can be planted. Resistant potato varieties must be used. The rotation should be free of potato crops for at least four (4) years out of five (5) and aim at breaks form potatoes and host crops of six (6) years as much as possible.

Planting stock for any crop other than potatoes used in these areas must come from PCN free and non-linked land or be treated as prescribed by local quarantine authorities.

If general surveillance records or information from other sources lead to any suspicion (supported by reasonable evidence) of PCN having entered an area, the above sampling regimes (monitoring surveys) need to be repeated for six (6) consecutive potato growing years. Area freedom may be suspended during that time. The suspension will be at the discretion of the responsible plant health authority and may be influenced by requirements from other jurisdictions.
Property and Paddock Freedom Protocols

Initial Surveillance to Establish Property Freedom

The following protocols apply to properties that are in areas of non-linked land. The property, which requires validation of PCN free status, must have clearly defined boundaries and be mapped to show these boundaries and the tested paddocks within the property and the associated leased paddocks. All potato growing paddocks of the property and associated paddocks that are leased must be tested after each potato crop harvest until all paddocks used for potato production have at least six (6) consecutive negative PCN tests. Responsible authorities may reduce the number of consecutive tests required per paddock depending on the provision of sufficient, credible general surveillance records including absence of production of other PCN host crops on the farm.

Surveying of the property should be based on:

- The standard Australian soil test of 100 % all of current production land in the property and associated leased land (Table 5-1).

Or

- The standard Australian Under Grader test of 100% of current production land in the property and associated leased land.

Follow Up Surveillance to Maintain Property Freedom

Property freedom status requires ongoing general surveillance based on farm record keeping showing that:

1. Only certified seed with a negative PCN test has been planted,
2. Volunteer potatoes (ground keepers) are eliminated,
3. No host crops are grown in rotation with potatoes,
4. Susceptible cultivars are only ever grown 1 year in 7 years of production and / or PCN resistant cultivars only are grown if rotations are closer,
5. Planting stock for any crop used on the property comes from PCN free and non-linked land (or is treated as prescribed by local quarantine authorities),
6. All equipment and containers entering the land from another property has been pre-cleaned free of soil.

Property and paddock freedom will also require low level monitoring surveys (soil testing), as there always is a risk of infested material (tubers, host material, equipment etc.) being brought onto the farm illegally. This ongoing monitoring will also be required to satisfy trading partners (Note: this monitoring approach has to be similar to that of fruit fly area freedom management, which requires ongoing monitoring of fruit fly free areas to satisfy trading partners).

If the general or monitoring surveillance or other sources lead to any reasonable suspicion of PCN having entered the area, the above survey sampling regimes need to be repeated. During this time property freedom free status for PCN may be suspended. The suspension
will be at the discretion of the responsible state plant health authority and may be influenced by requirements for other jurisdictions.

Survey Protocols to Prove Absence of PCN Following a Detection

The process for achieving area freedom following a long term eradication program requires initial fumigation of infested land, imposition of movement controls on host material, repeated testing of infested land, negative bioassays using PCN sensitive cultivars, and high level testing of approximately 10% of production land each year until all land is verified to be PCN free Collins et al (2010)²³.

Record Keeping and Reporting

Initial surveillance information and or specific survey data of a defined location whether it is an area, property or paddock (with map or GPS data) must be lodged with the state agriculture agency for trial approval of PCN freedom.

Risk mitigation strategies for all PCN protected areas (area freedom, property freedom and paddock freedom from PCN) must be implemented and recorded on farm and by state authorities as appropriate for state or national compliance auditing.

For internal audit purposes, records of official surveys must be audited by the jurisdiction in which the free areas are located and records of audits entered into relevant databases.

Managing New PCN Detections

Scope

This section sets out how the relevant Authority/Regulator (and or specific task force or management committee) will respond to and manage any outbreak of PCN.

New detections may occur as:

1. a result of a previously undetected infestation of *Globodera rostochiensis* (pathotype Ro1) at a new location that has spread from an existing population, or

2. a new incursion of *Globodera rostochiensis* (including a different pathotype to Ro1), or

3. an incursion of *Globodera pallida*.

N.B.: New incursions may be associated with potatoes or other vectors (imported bulbs, machinery etc).

Purpose

The purpose of this section is to have an emergency response to any new outbreak of PCN consistent with the PHA Plant plan.

The objectives are to develop a response plan to:

- rapidly determine the PCN species and pathotype and to provide the appropriate management strategy;
- rapidly determine the extent and possible source of infestation;
- rapidly contain/eradicate a new outbreak of PCN;
- minimise impact on market access and trade; and
- assist affected growers without increasing risk to industry;

Response to a New Detection of PCN

Where a known or new pathotype of *Globodera rostochiensis* or *Globodera pallida* is found, emergency response actions under the Emergency Plant Pest Response Deed (EPPRD) will be initiated. The Consultative Committee for Emergency Plant Pests (CCEPP) will manage this as per Figure 12-1.

The following key actions apply to an eradication program, but may also apply to containment of a new infestation under certain restricted circumstances.

1. Report of a suspected or known infestation of PCN (growers, technicians, extension specialists, consultants, scientists are obliged under state and federal plant health legislation to report new suspect PCN infestations.

2. Diagnosis of PCN confirmed by an independent certified laboratory.

3. Implementation of high intensity surveys and sampling of affected areas to delimit the extent of the pest or disease.
4. Implementation of pro-active control measures including safe disposal of infested crops, other sanitation measures, and possible application of nematicides and fumigants to lower pest numbers.

5. Monitoring of the PCN status of any previously affected areas (possible re-occurrence in those areas).

6. Monitoring of areas not previously infested with PCN to provide evidence that area freedom is maintained.

7. Completion of trace-back and trace-forward studies to determine linked and non-linked properties and establish the control zone based on risk of previous and ongoing spread.

8. Conducting a communication program to ensure stakeholders are well informed of the program.

9. Prohibition of stock and machinery movement off the farm(s).

After determining the control zone based on risk the Consultative Committee for Emergency Plant Pests (CCEPP) will decide on a case by case basis on an effective management, control and eradication program considering the above points.

**Reporting of a new strain or species of PCN to an authority**

The following summarises the key stages to go through after detection of a new strain or species of PCN.

1. The responsible Authority organises diagnostic procedures for the suspect PCN strain by at least two independent laboratories including diagnosis of the pathotype.

2. The Authority, as the lead agency notifies the Chief Plant Protection Officer (CPPO), and the national Consultative Committee for Emergency Plant Pests Diseases convenes to provide technical advice to determine if the PCN infestation is eradicable. If there is national agreement between government and affected industries that eradication is both feasible and cost beneficial, the Authority will develop and implement an eradication response under a government and industry cost sharing arrangement as per the Emergency Plant Pest Response Deed. The emergency response structure is shown in Figure 12-1.

1. The response plan will involve three action phases with the objective to eradicate the PCN infestation from the area and to reinstate area freedom from the pest (Table 12-7-1 to Table 12-7-3). A number of key actions will take place and these are described in Figure 12-2.

2. The Authority will use legislation to declare an area including suspected infested land and an outer boundary of adjoining linked land. The boundaries of a PCN quarantine area may also be based on natural geographic features and may include all or part of a production region.

3. Legislative controls will also be imposed on the movement of PCN host material, equipment, containers and soil. Other management measures to reduce risk of further spread of the pest from the infested and potentially linked land will also be enacted.

4. The Authority will undertake high level testing of paddock(s) in which the initial PCN detection was made (delimiting surveys) to clearly define the area of the land infested so
that it can be registered, permanently quarantined and managed to minimise the risk of further spread of PCN.

5. Intensive tracing studies of PCN host, equipment, containers and soil movements from the infested land will also be undertaken. The farming and ownership history of the land in the area will be scrutinised to determine linkages with the infested land. The gathering of this information will determine the extent of high intensity testing to delimit the distribution of linked land, validate that it has linked (rather than infested) status and to allow for registration and recording of land status.

6. The Authority will negotiate national market access requirements for PCN hosts, equipment and containers from infested, linked and any areas of non-linked land, which may have temporarily lost PCN free status (indeterminate PCN status). These movement conditions should be based on information in section 13.7.5 Summary of Movement Conditions’.

7. Initial controls, such as secure crop and tuber disposal are likely to be required; soil fumigation may be implemented.

8. The Authority would also implement a communication strategy. International notification to the International Plant Protection Convention and trading partners would be required, and would be managed by the Chief Plant Protection Officer and AQIS.

9. If eradication was not feasible then the infestation will have to be managed by the Authority. This may occur following consultation with a National PCN Management Committee.

10. The Authority will continue to administer regulatory requirements and oversee the validation of PCN status of infested land (details in ‘Delimiting and Managing PCN Infested Land’) and linked land (details in ‘Delimiting and Managing PCN Linked Land’,) until this land qualifies for removal from the register. This would occur through the incursion being officially declared as eradicated.

![Emergency Response Structure](image-url)
Figure 12-2  PCN Incursion Response Phases

Figure 12-3  Actions to be Taken Following Diagnosis of Suspected PCN
Table 12-7-1  Actions Taken During the Alert Phase

(Bold text = Action, Plain text = Responsible party)

<table>
<thead>
<tr>
<th>State Functions</th>
<th>National Functions</th>
<th>Industry Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirm pest identity</td>
<td>Confirm pest identity</td>
<td></td>
</tr>
<tr>
<td>Diagnostic team/international</td>
<td>Office of the Chief Plant Protection Officer</td>
<td></td>
</tr>
<tr>
<td>specialists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adoption of Precautionary measures –</td>
<td>Adoption of precautionary measures – nationally</td>
<td></td>
</tr>
<tr>
<td>state-wide</td>
<td>Domestic Quarantine and market Access Working Group</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chief Plant Health Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delimiting surveys</td>
<td>Advise NMG National Management Group (State and Federal Agriculture CEOs)</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>Chief Plant Protection Officer</td>
<td></td>
</tr>
<tr>
<td>Identify Chemical Strategies</td>
<td>Convene CCEPP</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>Consultative Committee for Emergency Plant Pests</td>
<td></td>
</tr>
<tr>
<td>Communicate results, declare</td>
<td>Declare incursion</td>
<td></td>
</tr>
<tr>
<td>incursion</td>
<td>Office of the Chief Plant Protection Officer</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)- Chief Plant</td>
<td>Declare incursion</td>
<td></td>
</tr>
<tr>
<td>Plant Health Manager in</td>
<td>Farmers</td>
<td></td>
</tr>
<tr>
<td>effected state</td>
<td>Peak industry body/bodies</td>
<td></td>
</tr>
<tr>
<td>Investigate feasibility of eradication</td>
<td>Consultative Committee for Emergency Plant Pests</td>
<td></td>
</tr>
<tr>
<td>Cost/benefit analysis</td>
<td>Consultative Committee for Emergency Plant Pests</td>
<td></td>
</tr>
<tr>
<td>Prepare EPP Response Plan</td>
<td>Prepare EPP Response Plan</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>Consultative Committee for Emergency Plant Pests</td>
<td></td>
</tr>
<tr>
<td>Prepare EPP Response Plan</td>
<td>Recommendation to NMG</td>
<td></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>Consultative Committee for Emergency Plant Pests</td>
<td></td>
</tr>
<tr>
<td>Prepare EPP Response Plan</td>
<td>Authorise eradication, approve EPP Response Plan and cost sharing arrangements</td>
<td></td>
</tr>
<tr>
<td>Draft Plan</td>
<td>National Management Group</td>
<td></td>
</tr>
</tbody>
</table>

NB: Some actions may occur simultaneously
### Table 12-7-2 Actions Taken During the Operational Phase

(Bold text = Action, Plain text = Responsible party)

<table>
<thead>
<tr>
<th>State Functions</th>
<th>National Functions</th>
<th>Industry Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate response strategy to property owner</td>
<td>Communicate Response</td>
<td>Communicate Response</td>
</tr>
<tr>
<td>Chief Plant Health Manager</td>
<td>Chief Plant Protection Officer</td>
<td>Peak industry body (bodies)</td>
</tr>
<tr>
<td><strong>Implement EPP Response Plan</strong></td>
<td>Implement EPP Response Plan</td>
<td>Implement EPP Response Plan</td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>– publicity and awareness</td>
<td>– publicity and awareness</td>
</tr>
<tr>
<td></td>
<td>Peak industry body (bodies)</td>
<td>Peak industry body (bodies)</td>
</tr>
<tr>
<td></td>
<td>assist in implementation of agreed communication strategy</td>
<td>assist in implementation of agreed communication strategy</td>
</tr>
<tr>
<td><strong>Provide regular reports and updates to CCEPP</strong></td>
<td>Evaluate eradicate on campaign progress</td>
<td>Evaluate eradicate on campaign progress</td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>– report to NMG</td>
<td>– report to NMG</td>
</tr>
<tr>
<td></td>
<td>Consultative Committee on Emergency Plant Pests</td>
<td>Consultative Committee on Emergency Plant Pests</td>
</tr>
<tr>
<td><strong>Down size response activities as appropriate</strong></td>
<td><strong>Endorse successful eradication/recommend termination of Response Plan</strong></td>
<td><strong>Endorse successful eradication/recommend termination of Response Plan</strong></td>
</tr>
<tr>
<td>Lead Agency (Agencies)</td>
<td>Consultative Committee on Emergency Plant Pests</td>
<td>Consultative Committee on Emergency Plant Pests</td>
</tr>
<tr>
<td></td>
<td>Recommendation to NMG</td>
<td>Recommendation to NMG</td>
</tr>
<tr>
<td></td>
<td>Consultative Committee on Emergency Plant Pests</td>
<td>Consultative Committee on Emergency Plant Pests</td>
</tr>
<tr>
<td></td>
<td><strong>Decision on eradication/termination</strong></td>
<td><strong>Decision on eradication/termination</strong></td>
</tr>
<tr>
<td></td>
<td>National Management Group</td>
<td>National Management Group</td>
</tr>
</tbody>
</table>

NB: Some actions may occur simultaneously
Table 12-7-3  Actions Taken During the Stand Down Phase

(Bold text = Action, Plain text = Responsible party)

<table>
<thead>
<tr>
<th>State Functions</th>
<th>National Functions</th>
<th>Industry Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare report for CCEPP and DQMAWG seeking agreement that eradication has been successful Lead Agency</td>
<td>Accept recommendation from CCEPP and declare successful eradication National Management Group</td>
<td></td>
</tr>
<tr>
<td>Review intra- and interstate quarantine arrangements Domestic Quarantine and Market Access Working Group/Lead Agency</td>
<td>Notify trading partners Biosecurity Australia/AQIS</td>
<td></td>
</tr>
<tr>
<td>Provide records of expenditure and reports to PHA Lead Agency/s</td>
<td>Incident debrief Lead Agency/s</td>
<td>Incident debrief Chief Plant Protection Officer</td>
</tr>
<tr>
<td>Incident debrief Lead Agency/s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB: Some actions may occur simultaneously

Record Keeping and Reporting

To be developed in consultation with government and industry, subsequent to review and endorsement of the Plan by the Plant Health Committee (PHC).
Delimiting and Managing PCN Infested Land

Scope

The phytosanitary measures described in this section are designed to detect, delimit and prevent PCN spread and relate directly to mitigating pathway risks.

They explain that infested land must have PCN management in place to reduce soil PCN levels using only resistant cultivars and long rotations (1 in 5 years, preferably 1 in 7 years). Potatoes from infested land require soil removal by washing or brushing to prevent cysts to be spread off farm. Bins and equipment used on infested land need to be thoroughly cleaned before movement off farm. Seed production is not permitted in infested land. All potatoes moved from infested land require permits. All potato consignments need to be labelled with growers ID and a statement “Not for Planting”.

Purpose

The phytosanitary measures described here are designed to delimit infested areas, to prevent PCN spread and to ensure safe market access for potatoes by mitigating the risks associated with spread pathways identified in the PCN pest risk analysis.

The objectives for managing PCN infested land are to:

- contain outbreaks of PCN;
- reduce populations of PCN at affected sites with the long term aim of eradication;
- protect uninfested land from potential infestation sources;
- minimise impact on affected businesses and people;
- enable biosecurity for market access for farmers with infested land;
- develop long term strategies for productive use of affected land;
- protect PCN Pest Free Areas and Pest Free Places of Production

Discovering Infested Land

All states have a requirement under plant health legislation for individuals, including farmers, to notify authorities of a suspected or known detection of PCN. PCN is usually discovered as a result of surveys to provide proof of freedom or to allow market access.

Defining Infested Land

Upon initial detection, the intensity (level) and distribution of the infestation should be delimited by high intensity sampling and testing (delimiting and monitoring survey). Based on trace-back and trace-forward procedures all areas identified as potentially infested will require high intensity surveying.

Registering Infested Land

Properties that are currently infested (have paddocks with a positive test for PCN) need to be recorded on a national/state register (BioSIRT or equivalent database system) as being
infested or potentially infested with PCN. It is mandatory for PCN status to be documented on land title declarations, but the information needs to be made available to buyers of land upon request to state quarantine authorities to buyers who intend to grow potatoes, root crops or nursery stock grown in soil or conduct any other activities that may involve the movement of soil or water from the infested area. The database has to be strictly managed with only few authorised persons having access.

Managing Infested Land

A paddock containing the infested area should be immediately taken out of potato and host crop production as well as production of any crops or animals that pose a risk of spreading soil or water to other areas.

Infested paddocks that are taken out of production should be fenced off, put down to pasture and action taken to eliminate self-sown potatoes, prevent water runoff (e.g. by using drains) and movement of livestock to PCN free areas. It is recommended the National Livestock Inspection Service (NLIS) should keep details on the PCN status of farms for stock movements, especially breeders dealing across state borders. Machinery and equipment used on the affected land must not be moved to other land without being cleaned free of soil in an area where the removed soil and wash water cannot affect other land.

In the event that the farmer cannot afford to put aside the infested land, the following conditions apply to the production of all crops and field-grown plants and the movement of these and other vectors of soil from the paddock or property:

As a regulatory requirement, the owner of an infested property must:

- Not grow seed potatoes or supply any tubers or plants to be used as seed or planting stock off farm;
- If growing potatoes:
  - switch to growing approved PCN resistant cultivars, and
  - grow from PCN certified seed or seed grown in a verified PCN free area;
- Maintain a farm biosecurity plan to address issues such as:
  - designated areas for visiting vehicles and transporters,
  - access for visitors to the farm,
  - livestock movement,
  - water run-off from infested areas,
  - other activities or processes that lead to infested soil move off the infested area,
  - control all volunteer tubers (ground keepers),
  - implement machinery cleaning protocols for internal movement, and
  - waste disposal protocols.

The responsible Authority will enforce and audit adherence to conditions and appropriate farm records.
These hygiene requirements would need to be revised if *Globodera pallida* was detected.

The ultimate aim for infested land is PCN eradication and the responsible Authority should work with the landholder towards this aim.

**Movement and Market Access Conditions from Infested Land**

A summary of movement conditions from infested land is shown in section 6.4 General Movement Conditions.

**Seed Potatoes**

Production and movement of seed potatoes or any tubers to be used for the production of a potato crop off farm from infested land is prohibited.

**Ware Potatoes**

The Authority must issue a permit to allow movement of PCN host material and other vectors of soil from infested land and associated property. This permit should be issued annually and the Authority must periodically audit records of production, product movement and associated activities.

All consignments of potatoes moving off an infested property are to be accompanied by an approved plant health certificate or declaration or equivalent documentation. Ware potatoes must be transported and packed under secure conditions as per permit by certified operators, and be kept segregated from other potatoes, and have specified end uses as determined by the Authority.

Potatoes destined for retail sale from infested land need to be marketed in approved sized packages which are labelled “Not for Planting”, must be washed (non resistant varieties) or brushed (resistant varieties only) to ensure that they are free of any soil that can be dislodged. They are not to be used as seed for planting off farm, must be labelled with grower’s name and address and must be kept segregated from unwashed / unbrushed and potentially infested potatoes at all times.

**Processing Potatoes**

Potatoes for processing pose a very low risk if washed or brushed prior to leaving the infested areas/paddocks and or conveyed to the processor under permit conditions, and secured to prevent any loss and spread of soil during transport.

Only appropriate PCN resistant cultivars should be grown (reconsider if *Globodera pallida* is detected). All containers (bags, bins, pallets, boxes, and containers) must be labelled with the grower’s name and regional identification for auditing purposes. Transport must be in clean trucks. All processing potatoes have to be cleaned to standard (washed for non-resistant varieties, washed or brushed for resistant varieties) and secured as per permit during transport and prior to processing.

If not cleaned to standard before leaving the infested area, tubers must be harvested under soil moisture conditions that allow removing a maximum amount of soil from tubers and then moved under permit to a certified processing facility for washing.
For non-resistant varieties, all solid and liquid waste generated through the supply chain including on-farm waste, waste from handling, grading and processing, transportation is to be securely disposed of by any of the following means:

- deposition in moist, anaerobic storage (e.g. a pit),
- secure burial,
- composting,
- heat treating or processing in moist conditions at 50 °C for 2 hours or 60 °C for at least 3 minutes, or
- sold for animal feed to certified feedlots with hard surfaces and which are not in potato production areas, and
- sewer disposal of liquid waste.

All waste from resistant varieties that contains any soil has to be treated the same way.

**Other PCN hosts**

Hosts of PCN soil-contaminated plants that cannot be washed clean, including bulb and tree crops or other root crops for subsequent commercial planting must not be grown on infested land.

All other (non-host) plant material for replanting or consumption must be washed free of soil prior to leaving the infested land or property. Movement of these items from infested land is only permitted under a permit issued by the responsible Authority and they cannot be planted in or near any potato production land.

Nursery stock grown in soil less potting media on hard surfaces, not in contact with soil and not irrigated with water sourced directly from runoff from infested land need not be regulated, as these items are not a significant pathway for PCN spread.

**Containers**

All containers (bags, bins, pallets, boxes, truck loads and containers) which have been used in association with infested land, or which have contained infested soil or host material need to be thoroughly steam cleaned and labelled with grower’s name and place of origin and with treatment records kept for auditing by the responsible Authority. If use is discontinued the containers should be burnt on site.

**Equipment**

Equipment leaving the property must be certified by the responsible Authority and be thoroughly steam cleaned so that no visible soil or organic material that could be dislodged remains attached. Such equipment is not allowed into verified PCN free zones unless treated with moist heat of 55 °C for 2 hours.

All machinery leaving infested properties must be steam cleaned following operations on infested land if they had contact with potatoes or soil. Vehicles used to transport potatoes and other vectors of soil associated with these vehicles, e.g. bins or bunkers and trays must also be thoroughly cleaned, particularly the tyres.
Soil and Plant Debris Waste from infested properties

Soil and plant debris waste must be kept on farm in a secure location such as a pit. Potato waste should not leave growing or packing properties unless under secure conditions for appropriate treatment, which can include secure burial, sewer disposal, pit storage, specified composting or heat treatment or further processing (e.g. starch production). Waste may also be secured and taken to certified feedlots that are not in PCN free production areas or properties, where it should be fed to livestock in a manner that prevents the spread of PCN.

Accreditation and Traceability Requirements

All growers / businesses with infested land who supply packing or processing facilities with potatoes (irrespective of whether the potatoes have originated from affected or unaffected paddocks) must be certified by the relevant state quarantine authority and be issued with a unique identification or accreditation number as shown in the grower accreditation list kept by the Authority. Labelling information required includes: grower’s name, date of packing and a code to show whether or not the land from which the potatoes were sourced was infested.

Changing Status to Linked Land

Infested land can be given linked land status if it is cleared under an approved protocol following intensive PCN monitoring and / or delimiting surveys for the defined production area. The recommended surveillance protocol is to have three (3) successive negative high level tests using a 5 x 5 m or equivalent sampling grid and analysis of 4 kg of soil per hectare (delimiting survey). In between tests, land can only be used for the production of PCN resistant cultivars and not for any PCN host crops. This cycle is likely to take 10-12 years. Refer to ‘changing the status of linked land’ for information on ongoing surveillance requirements.

The Consultative Committee for Emergency Plant Pests (CCEPP) may decide on a case-by-case basis on additional or special management, control and eradication requirements depending on risk.

Record Keeping and Reporting

To be developed in consultation with government and industry, subsequent to review and endorsement of the Plan by the Plant Health Committee (PHC).
Delimiting and Managing PCN Linked Land

Scope

The phytosanitary measures described in this section are designed to detect, delimit and prevent PCN spread from linked land mitigate pathway risks identified in the pest risk analysis.

They explain that seed production for planting off farm is not permitted on linked land, i.e. linked by sharing a boundary, direct water runoff, ownership in common with infested land, using equipment used on infested land, planting seed originating from infested land. Ware and processing potatoes need a permit to be moved and consignments labelled with grower ID and the statement “Not for Planting” are required until land can be de-linked. PCN resistant cultivars should be grown and no soil attached to potatoes leaving farms.

Purpose

The purpose of this section is to prevent PCN spread from potentially infected land and ensure biosecurity for market access for potatoes by mitigating the risks associated with spread pathways.

The objectives for managing PCN linked land are to:

- contain/eradicate outbreaks of PCN;
- protect non infested land from potential infestation sources;
- minimise impact on affected businesses and people;
- enable biosecurity compliant market access for farmers with linked land;
- develop long term strategies for productive use of linked land;
- establish a transparent PCN strategy and explain the responsibilities of every stakeholder;
- protect the market access for potato and other PCN regulated agricultural products from PCN Pest Free Areas and Pest Free Places of Production;
- validate change in status of linked land to PCN free land; and
- achieve low pest prevalence in an infested region by suppression of the pest and movement control activities.

Defining and Managing Linked Land

Using the PCN Plan and any relevant amendments, the Consultative Committee for Emergency Plant Pests (CCEPP) will decide on a case-by-case basis on the required control zone (linked land) and an effective management program for linked land.

Linked land is defined and delimited by surveys leading to and following the initial detection of infested land. Potentially linked land is identified according to its exposure to PCN infestation through trace forward and trace back surveys. Linked land, which is rated as being at high risk of PCN contamination due to the proximity to infested land, should be subjected to high intensity testing after producing potato crops, to provide ongoing validation.
of linkage status. Linked land requires ongoing management to prevent assisted and natural spread of PCN from infested land and to minimise any risk of spread to adjacent non-linked land or spread via seed tubers.

The Authority will require owners of linked land to develop and implement farm biosecurity plans as a condition for allowing movement of host material from the property. This plan will include using resistant cultivars, brushing to remove soil, secure waste management, cleaning of equipment and bins and will be audited periodically by the Authority.

Registering Linked Land

Linked properties and properties with linked paddocks must be mapped and put on a national/state register (BioSIRT or equivalent database system) as being linked. The responsible Authority must keep the register updated and only provide limited authorised personnel with access. It should not be mandatory for PCN linkage status to be documented on land title declarations, but the information needs to be made available upon request to the Authority.

Movement and Market Access Conditions from Linked Land

A summary of movement conditions from linked land is shown in section 6.4 General Movement Conditions

Seed Potatoes

Potato seed or any tubers destined to grow potato crops cannot be grown on or moved off linked land for off farm planting. Whilst seed grown on linked land can be used for replanting on the same farm, the paddock(s) such seed originates from or soil collected from the seed should be tested for PCN before usage.

Ware Potatoes

Ware potatoes can be grown and moved from linked land under a permit.

This follows an initial negative high intensity PCN delimiting survey (Table 5-2) to show that the linked land is not infested and, in subsequent years, negative monitoring surveys of 30% of the land in potato crops, focusing on high risk areas within the paddock (section 5, Table 5-2).

If only PCN resistant cultivars are grown following an initial high-level negative PCN test, retesting for linked land need only occur every 3-5 years when potato crops have been grown on the land.

Non PCN resistant cultivars must be brushed or washed and resistant cultivars brushed to remove all loose soil. All ware potatoes from linked land need to be marketed in packages of a size approved by the relevant state Authority and labelled “not for planting”.

Processing Potatoes

Processing potatoes can be grown and moved from linked land under a permit.
Both, PCN resistant and non-resistant cultivars can be moved following a negative standard detection survey for PCN i.e. on 30% of the crop focusing on high-risk areas within the paddocks.

Non-resistant varieties must be washed, and resistant varieties washed or brushed to remove all loose soil.

Only if not cleaned free from soil, and or an official negative PCN test is not available, the potatoes must be conveyed under secure transport and all solid and liquid waste generated in the handling and processing chain, including at the factory, and ex-factory disposed of using secure burial (not deep burial), sewer, pit storage, composting, heat treatment or sent to certified feed lots not in a potato production area. Raw potato waste may be delivered to certified feedlots in verified PCN free areas provided it is kept in a contained area and not directly spread onto pasture.

Resistant varieties, brushed or washed and other varieties washed to standard from paddocks with an official negative PCN test (PCN free), do not require waste treatment as for infested land. The waste must still not be transported to and disposed off in declared PCN free areas.

Other PCN Hosts

The Authority must accredit businesses producing plant material on linked land for movement off farm.

Hosts of PCN, soil-contaminated plants, including bulb and tree crops or other root crops for subsequent commercial planting can be grown and moved off farm following a negative standard detection survey test and they must be washed to remove all soil. In the absence of a negative PCN test, the responsible authority may decide that on different conditions.

Plants grown in field soil and root crops grown for culinary purposes must be washed free of soil.

Nursery stock grown in soilless potting media on hard surfaces, not in contact with soil and not irrigated with water sourced directly from runoff from infested land need not be regulated.

Containers

All containers (bags, bins, pallets, boxes, truck loads and containers) which have been used on linked land, need to be thoroughly cleaned (ideally with steam, at least using a pressure cleaner) and labelled with the grower’s name and place of origin, treatment prior to movement form the linked land or property, and records kept for auditing by the Authority.

Equipment

Equipment leaving a linked property should be thoroughly cleaned (ideally with steam, at least using a pressure cleaner) so that no visible, loose soil or organic material remains attached. Such equipment is not allowed into verified PCN free zones unless treated with steam or with moist heat of 50 °C for 2 hours or at least 3 minutes at 60 °C.
Waste

All waste contaminated with soil contaminated plant debris or soil from linked land must be securely contained. Waste also containing soil should be kept on farm in a secure location such as a pit. No potato waste containing soil should leave growing or packing properties unless under secure conditions for appropriate treatment, which can include secure burial, sewer disposal, pit storage, specified composting or heat treatment or further processing (e.g. starch production). Waste contaminated with soil may also be secured and taken to certified feedlots that are not in PCN free production areas or properties, where it should be fed to livestock in a manner that minimises spread of PCN.

Accreditation

All growers / businesses supplying packing facilities with potatoes from linked land must have a permit issued by the Authority to move the product. They must also be certified by the Authority and issued with a unique identification or accreditation number as shown in the grower accreditation list kept by the Authority.

Packing facilities receiving, packing and marketing potatoes from directly linked land need to be certified and ensure that they have approved protocols to segregate these potatoes at all stages from those sourced from PCN free areas.

Changing Status to Non-Linked Land

Linked land can be claimed to be free of PCN and non-linked under the following conditions, which ensure that there is no ongoing exposure to the pest:

- All of the linkage criteria no longer apply;
- It is cleared under an approved high intensity testing protocol of all land in a potato rotation (5 x 5 m sampling grid and analysis of 4 kg of soil per hectare with no detection of PCN); and
- The Authority removes it from the linked land register with notification to the owner and other relevant stakeholders.

General surveillance and maintenance testing will be required after clearance from the 'linked land' status depending on the remaining land risk status i.e. crop rotation, varieties and host crops grown, volunteer potato control and general paddock / farm management and hygiene procedures.

The Consultative Committee for Emergency Plant Pests (CCEPP) when deciding on a case-by-case basis on the effective management program for linked land will also decide on any further details in regards to delinking, depending on risks.

Record Keeping and Reporting

To be developed in consultation with government and industry, subsequent to review and endorsement of the Plan by the Plant Health Committee (PHC).
Managing Non-Linked Land

Scope

This section describes the management of non-linked land.

It explains that land in a PCN control area or land with indeterminate PCN status in a ‘High’ or ‘Medium’ land risk category needs to be surveyed to minimise the risk of PCN spread. Where area / property / paddock freedom from PCN has been validated by surveillance (general surveillance or specific surveys), the Plan requires implementation of farm biosecurity plans and appropriate record keeping to protect this status.

Purpose

This section defines the processes for validating and maintaining PCN free status for non-linked land within a PCN control area and for indeterminate land used for the production of potatoes.

The objectives are to:

- prevent PCN entering and establishing in non-linked areas;
- ensure that high and medium risk non-linked land with indeterminate status is surveyed for PCN and its absence verified;
- ensure that all non-linked land is protected from PCN by implementation of a hygiene code of practice (Appendix 1); and
- ensure that appropriate records are kept on-farm and by responsible authorities.

Establishing and Maintaining PCN Freedom

Surveillance protocols for establishing area, property and paddock freedom and ongoing validation of freedom for a defined area(s) of non-linked land are described in section 5 ‘Determining the PCN Status’.

The area of land, whether it is a region, property or paddock must have clearly defined and fixed boundaries and be mapped to show the boundaries and the area of land the surveillance records relate to. The area must have no known associations with any linked and infested land.

Phytosanitary Requirements for Safeguarding PCN Freedom

General Conditions

In order to maintain PCN freedom for a defined area, legislation is needed to regulate movement of potatoes and other host material, equipment, containers and other vectors of soil into the defined area from infested, linked and high risk non-linked land of indeterminate status.
Seed potatoes must only be planted in PCN area free land if certified as originating from a paddock which has had a negative result from a current official PCN test or is from an otherwise officially verified PCN free area, property or paddock.

Ware and processed potatoes brought into the area must be from a PCN free area, property or paddock or a crop that has tested free of PCN or according to conditions specified by the importing Authority.

Other planting stock for planting in the area must also be from a PCN free area, property or paddock, or be washed completely free of soil as per this Plan or otherwise meet the requirements the responsible Authority.

All equipment that has been used for cultivating potato land and bins used for the harvesting, packing or processing of potatoes or any other vector of soil from potato land will have to be cleaned to be free of soil and plant debris prior to entry unless coming from verified PCN free land.

**Additional Conditions for Property and Paddock Freedom**

In addition to meeting property or paddock surveillance standards, owners of properties or paddocks with PCN free status may be required to maintain a farm biosecurity plan, which may be auditable on a periodic basis by the Authority.

Such businesses can be certified by the Authority to provide PCN certification for potatoes produced on the property or paddock on the basis of annual audit of surveillance records and adherence to the farm biosecurity plan.

The farm biosecurity plan will include requirements for:

- Movement of host material, particularly potato seed, equipment and containers coming onto the property;
- Farm hygiene practices, which apply for movement of risk material within the property (especially in the case of paddock freedom);
- The sharing of machinery and equipment for cultivation of leased land or handling material from such land where the latter is of indeterminate PCN status of in the ‘High’ land risk category; and
- Movement of people and vehicles

Refer to (Appendix 1) for a PCN farm hygiene code of practice.

**Movement and Market Access Conditions from Non-Linked Land**

Ware and processing potatoes, equipment and containers that have been used on non-linked land with area, property or paddock freedom can move off the property without the need for consignment certification provided that these areas have been issued with an area/property/paddock freedom certificate and are clearly identified with the growers name and locality.
Seed potatoes from non linked land require a certified current negative test result for PCN unless they originate from an otherwise officially verified PCN free area, property or paddock.

In the absence of area, property or paddock freedom ware and processing potatoes and other non hosts for planting from non-linked land with indeterminate PCN status in the high risk category may be subject to risk mitigation measures and or certification requirements by an importing Authority on a case- by case basis.

A summary of movement conditions from non-linked land is shown in section 13.7.5 ‘Summary of Movement Conditions’.

**Record Keeping and Reporting**

Initial and required ongoing surveillance records for a defined location, whether it is an area, property or paddock (including a map or GPS data), must be lodged with the state agriculture authority for approval of PCN freedom.

Risk mitigation strategies for all PCN protected areas (area freedom, property freedom and paddock freedom from PCN) will have to be put in place and records maintained accordingly for national auditing.
PCN Certification of Potato Seed

Scope

The following section is based on the premise that potato seed and all other potato tubers used for planting of crops poses the highest risk of spreading PCN (Washington et. al. 2008, European Council Directive 2007/33/EC (2007). It recommends PCN certification for all seed to be planted for crop production off farm, backed up by regulatory controls to ensure seed is not grown in infested or linked land or non PCN certified seed is not moved into PCN free areas.

Purpose

To set out PCN certification requirements for all seed potatoes used for planting off farm in Australia.

PCN Certification for potato seed used off farm

Seed potato crops and potato tubers destined for crop production must not be grown, sold and or used in Australia without PCN certification, which means the seed tubers are officially certified:

- to be from an officially verified, maintained PCN free area, property or paddock, or
- to have an officially verified negative test result for PCN for the paddock the seed is produced on.

The National Standards for the Certification of Seed Potatoes\(^{24}\) already requires mandatory testing for PCN of all certified seed. This is the minimum certification standard.

All seed producers and grower selling seed from commercial crops need to be registered under certified schemes in all states.

Farm saved seed for planting on the same property would be exempt from certification requirements.

Area, Property and Paddock Freedom

Seed produced in areas that have achieved area, property or paddock freedom will require ongoing seed certification testing as per the Australian National Standard. N.B.: Area freedom requires low level monitoring surveys (soil testing), as there always is a risk of infested material (tubers, host material, equipment etc.) being brought into the area illegally. This ongoing monitoring will also be required to satisfy trading partners (Note: this monitoring approach has to be similar to that of fruit fly area freedom management, which requires ongoing monitoring of fruit fly free areas to satisfy trading partners). If area freedom status is temporarily suspended requirements may change.

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Area, property and paddock freedom from PCN for seed growing will be recognised following a government verified PCN survey program (refer to section 5 Surveillance - Determining the PCN Status of Land).

**Additional Requirements**

Areas established as PCN pest free areas for the purpose of potato seed production including down to paddock level must have restrictions placed on entry of host material, as well as dirty bins, equipment and any other plant or packaging materials as well as livestock and people carrying soil. The use of PCN certified seed should be mandatory. In addition, signage and awareness programs must be put in place to help ensure ongoing prevention of PCN entry.

**Record Keeping and Reporting**

To be developed in consultation with government and industry, subsequent to review and endorsement of the Plan by the Plant Health Committee (PHC).
General Movement Conditions for all PCN Host Material

Scope

This section outlines the movement conditions that are designed to mitigate, the risk posed by movement of various categories of PCN host material from infested, linked and non-linked land with indeterminate PCN status and PCN free land.

These conditions seek to harmonise, inter jurisdictional regulation on the movement of host materials from land with a higher risk rating to other land whilst minimising impacts on market access for produce and deployment of containers and equipment.

Purpose

To prescribe conditions for movement of PCN host material under appropriate risk mitigation protocols to ensure safe market access for products with different levels of risk and from land with different risk profiles.

General Conditions for Handling and Certifying PCN Host Material

These conditions may vary depending on whether the host material is packed or processed on farm or off farm, the PCN status of the material and whether it is potato seed, ware potatoes, processing or other host plant material.

Accreditation of Growers and Packers/Processors

Potato growers, packers, processors and businesses producing potatoes and other host plant material on infested, linked and non-linked high-risk land of indeterminate PCN status must be certified by the responsible authority to consign and certify material for movement off these items off farm.

The authority may seek to issue potato growers and nurseries involved with trading PCN host material with Property Identification Codes or similar identification, which could be applied to packages and consignments of the material to help traceability throughout the supply chain.

The Authority will issue permits to allow movement of host material from infested and linked land off farm for packing or processing.

Conditions for Packing/Processing

Packers and processors receiving host material from infested and linked land must be certified with the Authority.

They must reconcile details of consignments received with accompanying grower declarations and retain these declarations for auditing by the Authority.

They must ensure that systems are in place in the facility to segregate host material from infested and linked land from other crops and materials at all times during the handling process.
Conditions for Movement Off Farm

Each consignment moved off farm from infested and linked land must be accompanied by a grower declaration using a format approved by the Authority attesting to origin, identity and PCN status of the material. Consignments of host material from non-linked land may require a grower declaration if the land is of indeterminate PCN status (e.g. from within a temporary restricted or control area).

Potatoes from infested and linked land should be brushed or washed before leaving the land and the waste securely disposed of on farm or, alternatively, securely transported in a clean vehicle to an approved washing / brushing facility without losing soil or parts of the load in transit.

Transporters and containers must be externally cleaned of all soil before delivering host material to packing sheds and processing facilities and be cleaned internally prior to being sent to another property.

Soil Removal Standards

Host material from infested land should be washed to meet washing standards (Appendix 5). Conversely soil must be removed through mechanically brushing or an equivalent removal process to meet the high brushing standard (Figure 7-5) for potatoes, bulbs and other material that has been grown in infested and linked land.

Potatoes and other material grown in non-linked land must meet the soil standard for non-linked land (Appendix 5).

Labelling Standards

Harmonised national labelling standards should be adopted including:
- Identify of the grower or packer/processor;
- Identity of the location where the material was grown;
- Identity of the type of host material e.g. ware potatoes;
- The words “Not for Planting” or a code denoting infested and linked land; and
- A date or similar code denoting the date.

Conditions for Certification to Local and Interstate Markets

Infested Land:

Host material from infested land can only move under permit conditions, which may specify certification with a Plant Health Certificate issued by an authorised officer.
Linked Land

Host material from linked land can only move under permit and be certified with a either a Plant Health Certificate (PHC) or a Plant Health Assurance Certificate (PHAC) depending on the discretion of the importing state Authority.

Non-linked Land

Host material from non-linked land of indeterminate status may be certified with a PHC or a PHAC if required e.g. for high-risk land. Host material from non-linked land with confirmed PCN free area should not require individual consignment certification provided the State’s Chief Plant Health Manager had issued an Area Free Certificate and the consignment and packages are marked with the location of production.

Movement of PCN host material from high risk land with indeterminate status

Non-linked land of indeterminate PCN status in the ‘High risk’ category requires the following to allow movement of potato tubers and other plant material off farm:

- Seed potatoes, all tubers designated for planting of a commercial crop off farm, require a negative standard test on 100% of the crop each year;
- Ware potatoes need to be washed or brushed so that no loose soil adheres to tubers (refer to soil removal standards in Appendix 5);
- Processing potatoes must be send straight to the processing plant and stored in a way that prevents any spread of tubers or soil to other properties; loss of soil during transport must be prevented; wastewater or waste from the processing plant must not be re-used on farm land;
- Other field grown crops can only be sold or used off farm if free of soil;
- Other host crops for sale or use off farm must not be grown on the property.

Once the PCN status has been confirmed through a standard detection survey as described in area or property / paddock freedom protocols, the land risk status will be adjusted according to results and the above requirements will change according to finding and the new risk status.

Movement and certification Protocols

A series of movement, segregation, handling and certification protocols need to be developed or refined from existing interstate certification assurance protocols to cover the above processes in more detail.

Record Keeping and Reporting

To be developed in consultation with government and industry, subsequent to review and endorsement of the Plan by the Plant Health Committee (PHC).
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References


47. Plant Health Australia (2006) How to guide for the declaration of a pest free area following a pest incursion.


Appendices

Further appendices may be added including but not limited to procedures and fact sheet:

- Host plant list
- Effective control of volunteer potatoes (self sown potatoes, ground keeper)
- Recommended green crops and rotations to suppress and reduce PCN
Appendix 1  PCN Farm Hygiene Code of Practice

Objectives

- Best practice PCN management and farm biosecurity practices in the potato industry;
- Minimise the risk of new introductions of PCN;
- Minimise the risk of potential build-up of undetected populations of PCN;
- Minimise the risk of spread of PCN;
- Protect Australia’s ability to trade in potatoes without restrictions due to PCN domestically and internationally; and
- To quickly identify any new infestations of PCN.

General Farm hygiene procedures

Seed potato production is not permitted on PCN infested and linked properties.

- Only use certified seed from paddocks that have been tested for PCN (i.e. negative laboratory test results available).
- Foreign soil that has not been tested for PCN should not be brought into any areas where potatoes are being or may be grown or stored. This is any soil not known to be free of PCN. All foreign soil should be regarded as a potential source of PCN. This includes soil that may be carried on machinery, bags and bins.
- Drainage lines above a paddock and areas where equipment and machinery is/will be kept should also be maintained free of foreign soil.
- Paddocks must be protected from runoff (e.g. via drains) on especially eroding soil originating from areas containing host plants and or potentially infested materials and equipment. Runoff and erosion pose a high risk if involving water and soil from potentially contaminated areas, especially paddocks of unknown PCN status with high risk activities such as growing bulbs, corms or tubers, especially from coming from regions where PCN is known to occur. Paddocks that could pose a PCN risk should be tested according to their land risk rating and associated accepted testing procedures.
- Restrict movement of off-farm machinery, vehicles and bins to a small area of the property to reduce the chance of foreign soil contaminating paddocks where crops are grown. Where this is not practical, inspect and where necessary, thoroughly steam clean machinery and vehicles that may be contaminated with soil of unknown PCN status. Where practical, locate loading points at the edge of the property.
- Use signage to restrict where people, vehicles, bins and machinery can go.
- Have a hard surface area prepared for the wash down of vehicles and machinery that need to enter the property. Equipment shared between farms poses a considerable risk and must be cleaned properly, i.e. by partial dismantling if required and steam heat or hot water treatment (above 55°C). Also remove foreign soil from bins, bags, irrigation and other equipment before entering paddocks. Runoff and washed off soil from wash-down areas must be prevented from reaching paddocks or any materials, machinery, vehicles and equipment (e.g. bins) used for potato production or handling.
- Farm machinery must not be used for home gardens.
- Ensure visitors (e.g. farmers, sales representatives, agronomists, and contractors) have cleaned their footwear before entering a paddock. Have boot-cleaning equipment available or plastic over boots for visitors to use.

- Return bags and bins to the farm of origin. Potato bins and bags that are sent back to farms should not contain any soil foreign to that farm or have been used for other purposes such as storage of potatoes, waste or other products from the farm of origin.

- Use new bags on your own farm.

- New paddocks to be leased, bought, share-farmed or on loan for cropping should be tested for PCN if there is any doubt about whether PCN is present or not (medium to high land risk status).

- Waste and foreign soil from produce received into packing sheds and at processing facilities off other properties with unknown PCN status (land risk status and surveillance information) should not be spread onto paddocks to be used for potatoes. A record of where the waste material and soil is disposed of should be kept for future reference.

- Waste water from packing sheds and processing facilities should not be discharged into waterways without an appropriate settling time which will kill cysts (1-2 months) and should not be directly discharged onto paddocks used for potato production.

- Farmers should not allow foreign soil originating from overseas onto their farm. Businesses should prevent any soil from overseas contaminating packaging, equipment, potatoes and other produce going to potato farms. Farmers should not accept imported farm machinery, equipment or other goods contaminated with soil that originated from overseas onto their property without prior steam heat or hot water treatment (above 55°C). If a business receives anything from overseas with soil on or in it they should immediately contact an AQIS representative.

- Potato seed should have minimal levels of attached soil. Seed should therefore not be dug when the soil is wet. Dirty seed should be brushed to remove most of the soil prior to its delivery to the buyer.

- Potato seed should only be handled in clean containers / bags and equipment.

- The amount of soil carted on potatoes, bins, machinery and in vehicles should be kept to a minimum.

**Crop and livestock rotation procedures**

Livestock should be rotated so they graze in a paddock never to be used for potato growing before entering a paddock that will be used for potato cultivation.

Rotation with non-host crops is a strategy to minimise risk and may reduce the land risk status and thus surveillance requirements. Growing of host crops such as tomatoes, eggplants and capsicums in rotation with potatoes increases the land risk status and regular PCN surveillance may be required if host crops are used in a rotation i.e. the host crop is considered the same as a potato crop in regards to risk. Potato regrowth (including self sown tuber / ground keepers / volunteer potatoes) that maintain or increase potential infestation should be destroyed in the following crop via suitable herbicides and rogueing. If this is not possible, the land risk status and surveillance requirements may change. A minimum break from potatoes and other host crops of four (4) years are required to minimise risks of PCN multiplication; a break of six (6) years is recommended.
Identification and reporting

Potato growers and their staff should learn how to identify PCN symptoms.

If crops show suspicious symptoms they must ensure that the cause is promptly identified seeking professional assistance as required.

*If a new PCN outbreak is suspected, this needs to be reported immediately to the local Department of Agriculture, so that if its presence is confirmed, every attempt can be made to contain and eradicate the pest.*

Wash down and cleaning of trucks, vehicles, machinery and equipment that may have come in contact with PCN contaminated soil

Before inspecting or cleaning any machine, company guidelines should always be followed to make it safe. For most types of machinery this includes:

- Machine is immobilised – level ground, parking brake, wheels chocked
- Blades, buckets, forks or other raised implements are lowered to the ground
- The key when working inside large machinery is removed so that it cannot be started
- Any free moving parts which could cause injury if they move during the inspection or cleaning process e.g. inspection hatches, free moving blades, have to be secured.
- Travel pins or use supports have to be inserted if part of a machine or implement has to be raised – never rely on hydraulics when working under these parts of a machine.

*Removing Covers and Guards*

Covers, guards and inspection plates/hatches will often need to be removed and replaced as part of the inspection and cleaning process. The location and procedures for removing and replacing these items will vary between equipment types and models, meaning that operator or workshop manuals may need to be consulted. Always use correct tools for removing and replacing covers and guards.

In some instances, an operator may become familiar with places where contaminants accumulate on a particular machine and there may be ways of making this process easier (e.g. replace hexagon nuts with wing nuts so that spanners are not required). After inspecting and cleaning, always ensure that covers and guards are replaced correctly and checked.

*Areas of machinery, trucks, vehicles and equipment which need to be inspected and cleaned from soil*

The areas of a machine, truck or vehicle that need to be inspected and cleaned will depend on the type. PCN can be transferred in wet soil attached to wheels, tracks or parts of the machine that work in the ground. PCN can also be transferred in dust that can accumulate in many parts of machines – engine bay, cabins and air intakes etc.
Given the diversity of possible contamination points, it is recommended that checklists of inspection and cleaning points be developed and used to guide the inspecting and cleaning process. Generic checklists are available for some types of equipment, but due to variation between models and fitted attachments, these usually need to be adapted for specific items of machinery. Such checklists not only make the inspecting and cleaning process easier, but when completed, dated and signed, can also be used to prove that the machine has been cleaned to meet client’s expectations and regulatory requirements.

Depending on the situation, other machinery, equipment and support vehicles may also become contaminated on a site. These will also need to be inspected and cleaned prior to leaving the site.

Once the inspection/cleaning process has been completed, ensure that the cleaning equipment itself and clothing are secured and free of soil contamination.

**Disinfection for people and sampling equipment**

It is recommended that a disinfection station be set up on a suitable hard stand or grassed area. Samplers shall:

- Remove large clods of soil and plant material from boots and equipment used (e.g. with a screwdriver or brush).
- Scrub boots and sampling gear clean of any plant and soil matter in a footbath containing water and detergent.
- Place 10 cm of 1.0% available chlorine in the form of sodium hypochlorite solution into container and rinse all boots, brushes screwdriver and sampling gear. Gloves should be worn to protect sensitive skin and avoid splashing on clothing and exposed skin, rinse hands in clean water.
- Discard the water and detergent from the first footbath, and then rinse the detergent footbath with the contents from the chlorine disinfection footbath.
- Discard all contaminated equipment.
- Samplers must change into clean footwear before leaving the site.
- If re-entering the block for any reason change into field boots and repeat disinfectant procedure before leaving.

The Authorised Person shall inspect all cleaned equipment prior to leaving the paddock.

**Disposing of Waste**

The cleaning process may generate waste in the form of contaminated water, dust, debris or chemicals. Where cleaning is completed at the job site, waste will often be left at the cleaning site (e.g. wash down water or debris blown from a machine with compressed air). If cleaning is undertaken in a paddock, little can be done to remove contamination, highlighting the importance of selecting an appropriate site. Where chemicals are used as part of the cleaning process, they should be disposed of according to enterprise, label and/or legislative requirements – decontamination sump.

Large amounts of straw and other debris can block piping and sumps specifically designed for chemical wash down. If these are to be used, then grills should be placed over drains to trap larger debris, which can later be collected and buried or burnt. Vacuumed material will
also have to be disposed of, either by dumping at the site, transporting to another location or by burning.

Permits may be needed if contaminated material has to be transported to another location for disposal. Under PCN legislation, this includes soil and organic matter even if they are sealed in a suitable container. Similarly permits may be needed if waste is to be buried in a recognised landfill or rubbish tip. The Team Leader needs to inspect all equipment, which must be cleaned so that it is completely free of soil and plant debris prior to leaving the paddock.

To minimise the risk of contaminating cleaning and waste disposal sites, as well as the risk of spreading PCN during transit, contaminants are best destroyed at the cleaning site whenever possible — bury dust soil and organic matter — assume waste contains viable PCN cysts. Depending on the situation, cleaning equipment, personnel and support vehicles may also be at risk.

**Records and Reporting**

Inspection and cleaning checklists and sample collection forms may often be sufficient types of records for proving adequate hygiene procedures, but in some cases further documentation may be necessary. For example for people participating in industry codes of practice or certified inspectors. The latter may require quite detailed records to substantiate compliance with regulations.

Reasons for keeping records of hygiene procedures include but are not limited to:

- Your own purposes – workload management or job costing
- Client information or evidence of work done
- Adherence to industry code of practices or regulatory guidelines
- Evidence of compliance with legislation – state government compliance audits

It is recommended for potato businesses to make this Code of Practice part of their QA system by developing HACCP documentation in line with its requirements.
Appendix 2  Field Surveillance for PCN (Draft)

Objective

Determine if the pests golden potato cyst nematode *Globodera rostochiensis* or pale potato cyst nematode *Globodera pallida* are present in any land of the potato growing regions of Australia.

Describe the process of planning and conducting field sampling undertaken in relation to PCN detection, monitoring or delimiting surveys.

Registration

Potato growers need to become registered with individual state quarantine authorities and nominate the land they have in potato rotation. Any changes to the situation will be made annually. The registration will be required to determine the land risk status and through that surveillance requirements.

Responsibility

Growers may each nominate a person or persons to conduct or oversee the collection of PCN field samples, maintain the appropriate records/documentation and get samples ready for collection by the relevant state quarantine authority or dispatching to the certified laboratory. This person may also train other staff to complete the tasks in accordance with the approved protocol.

Alternatively the sampling process will be conducted through the responsible state authority.

For the purpose of this protocol, persons authorised to field sample for PCN will be known as the ‘Authorised Person’.

Auditing

An auditing schedule will be implemented to ensure soil samples are being collected and dispatched in accordance with the approved protocol and to ensure receipt records and sampling documentation are maintained correctly. Soil sampling for PCN should be made part of companies’ QA systems.

Copies of all records must be kept for auditing purposes. Growers operating under a self-managed sampling protocol will be audited periodically to ensure that all protocol requirements are being met.

Protocol

- **Notifying a Property Owner**

Property owners/managers will be notified in advance of sampling requirements and, if they are not in charge of sampling, arrival of an official sampler and be asked to provide locations of potato crops to be sampled for PCN in the year in question e.g. via a farm map.

- **Sample Documentation / Traceability**
Property details will be recorded on a survey sheet including GPS co-ordinates of the production unit as well as paddock name and location, sampling date, grower, region, variety, seed source, quality and any other pertinent information (e.g. planting and harvesting dates, delivery date, sampling times, responsible persons names).

- **Sampling Procedure**

Preferably, sampling should take place around / after harvest time.

- Calculate the area under potato production and the number of samples to be collected depending on the sampling intensity and procedure required;
- Label sample bags with growers name and sample number, using a permanent marker;
- Prepare Survey Sheet(s), sampling equipment and ensure hygiene requirements can be met.

The authorised (trained / certified) sampler will inform the property owner or manager when sampling is completed and may discuss any survey issues with the property owner or manager.

The Authorised Person will inform the laboratory and authorised state authority of completed sampling and dispatched samples.

1. **Very High Intensity Sampling (Delimiting Surveys)**

One sample of soil, weighing approximately 4.0 kg for every two hectares planted with potatoes shall be collected for analysis.

- Samples are collected with a sampling tool which is constructed from box channel aluminium with a cross section of 10 mm x 10 mm and which is pushed at least 10 cm into the soil. This size soil sampler is designed for collection of approximately 4 kg per hectare;
- Walk down rows to be sampled and every 12 to 14 paces (approximately 10m) take a sample with the tool. Samples are taken by pushing the tool into the side of the bed to at least the mark on the tool, then place the soil collected into a bucket;
- At the end of the row, mix the soil in the bucket and transfer into labelled sample bag; and
- Once samples have been collected place them all in a garbage bag with the Sample Documentation (Survey Sheet).

2. **High and Medium Intensity Sampling (Detection and Monitoring Surveys)**
Refer to the Australian Standard\textsuperscript{25} or EU Directive (69/465/EEC) for alternative sampling procedures for detection and monitoring surveys including seed certification.

3. Targeted Sampling

Targeted or representative sampling refers to sampling parts of production units or paddocks that would show higher infection levels than the remainder of the unit/paddock. The Plant Health Committee and responsible state authorities may approve the use of these methods for detection and monitoring surveys as well as seed certification depending on conditions:

*Sampling of 50\% of land* should be as per above, but collecting soil from half of the paddock area but including all high-risk land, i.e. near paddock entrances, where bins are dropped and where any waste was discarded.

*Sampling of 30\% of land* should be as per above, but collecting from one third of the paddock area but including all high-risk land, i.e. near paddock entrances, where bins are dropped and where any waste was discarded.

*Sampling of 10\% of land* should be as above, but collecting from a tenth of the paddock area, but including all high-risk land, i.e. near paddock entrances, where bins are dropped and where any waste was discarded.

Appendix 3  PCN Surveillance via Soil Sampling from Machinery and Equipment (Draft)

Objective

Determine if the pests golden potato cyst nematode *Globodera rostochiensis* or pale potato cyst nematode *Globodera pallida* are present especially in any high or medium risk land of the potato growing regions of Australia (detection and monitoring surveys).

Registration / Responsibility

Potato growers and packing or processing facilities need to become registered with individual state quarantine authorities, and will each have a nominated person or persons to oversee collection of samples, maintain the appropriate records/documentation and get samples ready for collection by the relevant state quarantine authority or dispatching to the certified laboratory. This person may also train other staff to complete the tasks in accordance with the approved protocol.

For the purpose of this protocol, such person will be known as the ‘Authorised Person’.

Auditing

An auditing schedule will be implemented to ensure soil samples are being collected and dispatched in accordance with the approved protocol and to ensure receipt records and sampling documentation are maintained correctly. Soil sampling for PCN from machinery or equipment should be made part of companies’ QA systems.

Copies of all records must be kept for auditing purposes. Packing facilities operating under this protocol will be audited periodically to ensure that all protocol requirements are being met.

Sampling and Recording

Packing and processing facilities will need to take representative samples from traceable (to a production unit) potato consignments that are delivered to them from their own farm(s) and / or crops within their local growing region. For the purpose of this protocol, the responsible government state quarantine authorities will define the sampling regions that apply for their state.

An authorised person will conduct sampling in each potato packing facility. This person must be familiar with the requirements of the approved protocol and will be responsible for all facets of the administering the protocol including but no limited to:

- Gathering the representative soil samples;
- Recording the production unit / paddock name and location, sampling date, grower, region, variety, seed source, quality and any other pertinent information (e.g. planting, harvesting, delivery dates, sampling times, responsible persons names) relating to an individual consignment of potatoes;
- Storage of samples before sending them to be tested; and
Preparing, packaging and sending samples to the certified laboratory for testing.

To collect suitable soil for the purpose of testing for PCN, samples must be taken before potatoes are washed. The most desirable source for collecting samples will be:

- soil falling through webs e.g. during pre-grading on harvesters (for potatoes that will be washed)
- soil falling through pintle rollers or pre-grading webs on grading lines

Soil containing plant roots is more likely to also contain cysts, therefore it is advisable to collect soil from the early part of the harvesting or grading process, and before too much root material is lost. The approved protocol has to state which sampling points are permissible.

**Sample Volume and Sampling Frequency**

The amount of dirt to be collected per ha of production land must be the same as would be collected during soil sampling in the field. Amounts therefore depend on the relevant testing protocol for different land risk status categories.

The sampling frequency or duration per production unit has to be designed to collect the required amount of sample volume during the time the tubers from that production unit is harvested or graded. Care has to be taken that sampling takes place throughout the harvesting or grading time for that production unit to produce a representative sample.

If the sample volume collected is too large, it has to be well mixed and subsampled so that the correct sample volume is sent to the lab.

**Soil Sampling Equipment and Technique**

Details of the equipment and technique will have to be determined e.g. by the Plant Health Committee in Consultation with industry and R&D. There may be several options required depending on machinery and facility designs.

The protocol for the preparation of composite samples, labelling, handling and dispatch of samples once taken will be identical to that for field samples.

Hygiene procedures for people and equipment will be identical to that for field samples.

The Authorised Person will inform the property owner or manager when sampling is completed and may discuss any survey issues with the property owner or manager.

The Authorised Person will inform the laboratory and authorised state authority of completed sampling and dispatched samples.

**Testing Results and Records**

Records of negative PCN test results need to be kept by the landowner as proof of area freedom, property and paddock freedom. All certified PCN testing laboratories and responsible state authorities will also keep a confidential database with testing results.
Any positive results from samples trigger a high intensity filed survey of the production unit(s) paddock(s) in question. These would only be given PCN infested status after confirmatory field-testing.

While the field-testing is taking place, the production unit(s) paddock(s) in question and potentially the farm and a buffer zone may be subject to some quarantine regulation by the responsible authority.
Appendix 4  Analysis and Diagnostics

All PCN soil samples shall be analysed by an approved laboratory. The below methods may be used. Also refer to: Diagnostic Methods for Potato Cyst Nematodes *Globodera spp* (PaDIL - Plant Biosecurity Toolbox)\(^{26}\).

**Fenwick Can Flotation Method**

Flotation of organic matter using Fenwick cans, followed by microscopic examination of filter papers is the traditional method of determination of nematode cyst numbers in soil (Spears 1968, Hinch 1991, Wang and Thurston 2006). This is a time consuming process, which requires a skilled diagnostician.

**PCR and DNA Analysis**

A number of workers have published DNA methods for detection and quantification of PCN (Bulman and Marshall 1997, Quader et al 2008, Collins et al 2010), and these methods allow for identification of Globodera to species level, but not to biotype level. The current methods are not yet more sensitive than the traditional flotation method for determining cyst or egg number, however further development of these technologies is likely. Sequencing of PCN DNA has already shown the relationships of Victorian populations of *Globodera rostochiensis*. There is need for DNA identification to biotype level of both *Globodera rostochiensis* and *Globodera pallida*.

\(^{26}\)\[http://www.padil.gov.au/pbt\] This Diagnostic Protocol can be constantly updated and is only correct at time of printing.
Appendix 5  Soil Removal Standards

The following three images show the soil adherence standards for brushed potatoes from non linked land and linked land and the washing standard.

Figure 7-4  Brushing standard for non-linked land - only 1 small soil patch per tuber

Figure 7-5  Brushing standard for infested and linked land: only a small patch of attached soil on 1 in 5 potatoes i.e. soil not falling off when tubers are shifted
Figure 7-6  Washing standard with no detachable soil lumps
Appendix 6: Comprehensive List of Potato Cultivars Highly Resistant to the Ro1 Pathotype of *Globodera rostochiensis*

The following table has been prepared by cross referencing all major potato cultivar databases and lists 365 cultivars with high resistance (9 points on the UK scale) to the Ro1 strain of *G. rostochiensis*. There are many additional cultivars with high resistance (8 on UK scale) but these have not been included. Many are patented cultivars and require PVR/PBR licensing. These data was compiled from a number of sources (UK, EU and US cultivar lists). Some databases contain serious errors. For example the European Potato Cultivar Database lists Desiree as being highly resistant to *G. rostochiensis* race Ro1 when it has been confirmed by a number of sources to have low resistance.

Uses: t=table or multi purpose, c=chip, p=processing.  Season: E=early, M=midseason, L=late.

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